DIAGNOSIS

OF

OVARIAN CYSTS

GARRIGUES

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DIAGNOSIS

OF

OVARIAN CYSTS

BY MEANS OF THE

EXAMINATION OF THEIR CONTENTS

BY

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DIAGNOSIS

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EXAMINATION OF THE CONTENTS.

Fluids tapped from supposed tumors are often sent to New York and other scientific centres, in order to obtain an authoritative diagnosis from some expert. The question, if a diagnosis can be based on the mere examination of such fluid, is therefore of great practical importance. If we search books and journals, we will find a good deal of information on the subject, but the views expressed by different observers in regard to the diagnostic value of the physical, chemical, and microscopical characters of the different fluids vary to such an extent that I have felt inclined to examine the question anew by direct observation, hoping that a careful study of the rich material occurring in this metropolis might contribute somewhat to settle it.

At the first meeting of the American Gynecological Society, one side of the question was incidentally touched upon.[1] Dr. Robert Barnes said that it was not the first time he had seen

[1] Transactions, Vol. i., pp. 194–197.

fallacious results follow a microscopical examination of fluid drawn from a tumor in the abdominal cavity, or even from an ovarian cyst. Dr. Engelmann declared that he did not think that we could make a diagnosis by means of the microscope. Dr. Chadwick stated that he had sought for the ovarian cell in many ovarian fluids, and submitted many fluids to more experienced microscopists than himself, invariably without success. Dr. Thomas said that the average microscopist certainly could not make a diagnosis of ovarian cysts by examining the fluid contained in the cavity of the sac. On the other hand, Dr. Byford remarked that, so far as his experience went, perhaps covering thirty-five or forty cases, in which the tumor had proved to be ovarian, the ovarian corpuscles, as described by Dr. Drysdale, had been found.

Dr. Emmet[1] has in two instances of doubt operated and removed ovarian tumors after experts were unable, from an examination of the fluid, to give the slightest information in regard to the character of the tumor.

Again, Dr. Goodell[2] in a clinical lecture said, in speaking of the fluid withdrawn from a tumor, "It is syrupy and of brownish color. It looks very like that of an ovarian cyst, but *I shall defer giving a positive diagnosis until it has been examined by the microscope*," thereby showing that he expected to gather valuable information from this kind of examination.

W. L. Atlee placed great confidence in the diagnostic value of the physical, chemical, and morphological properties of the fluids tapped from the abdomen, as appears from several passages of his celebrated work on "The Diagnosis of Ovarian Tumors." He thought that, in the large majority of cases, a mere glance at the fluid sufficed to draw a very correct inference as to the character of the disease.[3] As to chemical tests, he thinks that the great excess of albumen would be very valuable as confirmatory of the diagnosis of ovarian disease. "In doubtful cases," says he, "the microscope furnishes the most positive means of deciding the question. . . . I know of no other fluid, whose physical, chemical, and microscopical character corresponds with those of the fluid of an ovarian cyst."

[1] T. A. Emmet: Principles and Practice of Gynecology, second edition, Philadelphia, 1880, p. 797.

[2] Wm. Goodell: Lessons on Gynecology, Philadelphia, 1879. p. 295.

[3] W. L. Atlee: Diagnosis of Ovarian Tumors, Philadelphia, 1873, pp. 56, 58, 60.

A whole chapter in Atlee's book, as well as a paper read before the American Medical Association,[1] contain Dr. Drysdale's views on the subject. This author has a greater experience with regard to ovarian and other abdominal fluids than any other investigator. Nay, it is not unlikely that his "over fifteen hundred cases of abdominal fluids"[2] beat the united experience of all the other observers who have put on record the results of their examinations. No wonder, therefore, that Dr. Thomas, in the above-mentioned discussion, had to state that in no case in which he had sent fluid to Dr. Drysdale for examination, and he had made the diagnosis of ovarian tumor, had he (Thomas) failed to find an ovarian tumor present. But with all regard due to this indefatigable observer, and with entire faith in his skill on this point, we must still guard ourselves against being led into error by his teachings. Dr. Drysdale declares[3] that he has found the ovarian granular cell *almost* invariably present, which implies that even in his own experience ovarian fluids have occurred in which he failed to find it. On the other hand, he "means not to assert that cells, having a similar appearance, may not be found in cysts met with in other parts of the body;" but this cell, when found in this locality, he believes to be "pathognomonic of ovarian disease." Later in this paper we will see that he states himself to have found these bodies in a case of renal cyst.

E. R. Peaslee[4] confounded Drysdale's corpuscles with the much larger "gorged granule" (read "cell gorged with granules") of Nunn, and says that he himself has not been able to detect them in the fluid of all cysts known to be ovarian.

Most English authors are more or less opposed to the idea that a diagnosis can be derived from the nature of the fluid. Baker Brown[5] had investigated the question with his friend Mr. Nunn, and gives the conclusions arrived at by the latter in these words: "What I believe to be the value of a micro-

[1] T. M. Drysdale: On the Granular Cell found in Ovarian Fluid, Philadelphia, 1873. Extracted from the Transactions of the American Medical Association.

[2] Amer. Gyn. Trans., vol. i., p. 195.

[3] Reprint of paper, p. 3.

[4] E. R. Peaslee: Ovarian Tumors, New York, 1872, p. 117.

[5] Baker Brown: Ovarian Dropsy, London, 1868, p. 47.

scopical examination of a fluid is, that it may serve to strengthen an opinion; but alone, it ought not to decide one." Sir J. Y. Simpson[1] expressed himself thus: "There are no deductions of any practical import, so far as I know, to be drawn from the contained fluid." Mr. Spencer Wells[2] gives a copious abstract of Eichwald's paper (see p. 12), but does not once, in his long chapter on diagnosis, say that he has gained any light from the microscopical examination of the fluid. As to the chemical characters, he states that reliance cannot be placed on them. In his more recent lectures on abdominal tumors,[3] he states likewise what Bennett and Drysdale have found, but does not say that he ever has derived any benefit from this kind of examination. By means of the serous character of the fluid, and blood being intimately mixed with it, he has sometimes satisfied himself that tumors which others considered to be ovarian, were really fibrocystic uterine growths.[4] Graily Hewitt,[5] says that a microscopical examination may serve to strengthen an opinion, but alone ought not to decide one, except in the case of a dermoid cyst. Matthews Duncan[6] said in 1875: "We are still without means of diagnosing ovarian dropsy by examination of the fluid." Lawson Tait[7] says still later: "Great hope has been entertained that by chemical analysis of the fluid removed by tapping, or by the microscopical investigation of elements contained in it, assistance might be gained in the diagnosis of doubtful cases; but after having, as I believe, read everything which has yet appeared on the subject, and after having devoted a very considerable amount of labor to both of these inquiries, I have come deliberately to the opinion that the hope is fallacious. As yet no chemical compound is known which is peculiar to ovarian fluid, and I am absolutely certain that no microscopical element is of any value for differential diagnosis." According to the same author,[8] Dr. McMunn, of Wol-

[1] J. Y. Simpson: Diseases of Women, New York, 1877, p. 400.

[2] T. Spencer Wells: Diseases of the Ovaries, London and New York, 1872, pp. 89–116, p. 133.

[3] Lancet, 1878, June 15th, p. 883. [4] Diseases of the Ovaries, p. 201.

[5] Graily Hewitt: Diseases of Women, first American edition from second London edition, 1868, p. 329.

[6] Edinburgh Med. Journ., March, 1875, p. 842.

[7] Lawson Tait: Diseases of Women, London and Edinburgh, 1877, p. 270. [8] Lancet, February 7th, 1880.

verhampton, has tried the spectroscope, and his investigations led only to negative results.

Knowsley Thornton[1] is the English author who seems to place most confidence in the nature of the fluid as a guide in the diagnosis of ovarian and kindred tumors, but he lays more stress on the physical properties than on the microscopic elements of the fluid. Withal his expressions are very guarded, and do not promise more than a probability. As to Drysdale's corpuscle, "he does not think he is prepared altogether to pin his faith to this ovarian cell or any single cell as a certain test; but he thinks its presence, along with other elements which we usually find in ovarian fluids, is a very valuable piece of confirmatory evidence in any doubtful case."

Passing to Germany, we find the great microscopist, Waldeyer, and the practical ovariotomist, Spiegelberg, alike positive in their declarations in favor of the diagnostic value of the examination of the fluid. The former states[2] that he has examined fluid tapped from about twenty cases in Spiegelberg's clinic, and "never has the result deceived him, at least so far as operation or post-mortem examination has afforded an opportunity to test its correctness." Spiegelberg[3] says that "if the examination of the fluid gives a certain result, be it negative or positive, then it is absolutely reliable, in which respect it differs from all other symptoms or signs;" and in another place[4]: "The diagnostic puncture does not always give positive information as to the origin of an abdominal fluid, but when it does so, the result is decisive, while the physical and other kinds of examination yield only doubtful results."

But both these authors speak only of the diagnosis between ovarian and ascitic fluid, which is much easier than that between the fluid from an ovarian cyst and that from other cysts.

According to Westphalen, the tests of paralbumen and metalbumen are unreliable. He lays most stress on the spontaneous coagulation or non-coagulation, but adduces cases to prove that even this may deceive. As to the microscopical

[1] Med. Times and Gazette, May 13th, 1876, p. 519.
[2] Archiv für Gynäkologie, 1870, Vol. i., p. 266.
[3] Volkmann's Klinische Vorträge, No. 55, p. 436.
[4] Archiv für Gynäkologie, 1872, Vol. iii., p. 282.
[5] Archiv für Gynäkologie, 1875, Vol. viii., pp. 80-81.

elements, he takes, like Spiegelberg, the presence of columnar epithelial cells to be decisive, but says that often they are not found. Then he thinks that so considerable an amount of so large granular globules would scarcely be found in any other fluid than that of an ovarian cyst. He does not at all mention the small granular cell, which, according to Dr. Drysdale, is the characteristic element.

In the French literature I find that the great ovariotomist, Kœberlé,[1] declares that "in most cases the results of an exploratory tapping can settle the diagnosis." He bases it on the presence of paralbumen and the granular globules, by which he means the large granular cells (Bennett's corpuscles). The small granular body is by him taken to be Lebert's pyoid bodies.[2] Péan, so famous for his success in the ablation of the uterus for fibroids, holds the physical, chemical, and histological examination of the fluid contained in abdominal tumors to be one of the most reliable elements of the diagnosis.[3]

This great diversity of views among so good observers is, I believe, to a great extent attributable to a confusion of what is the rule and what the exception. Some authors have claimed that this or that property is characteristic of ovarian fluid, and, therefore, an infallible guide to a sure diagnosis; others have found cases where the rule did not hold good, and disgusted they have given up the whole subject as utterly worthless. I believe that the truth is to be found midways between these extremes, and that the examination of the fluid affords a very valuable aid to diagnosis, but that it would be rash to base a diagnosis on the characters of the fluid alone.

In the following pages I shall give a description of ovarian fluid, based on my own observations carried on during eighteen months; but where my material gives out I shall supplement my own experience by that of others.

[1] E. Kœberlé: Des Maladies des Ovaires et de l'Ovariotomie. Paris, 1878. Extrait du Nouveau Dictionnaire de Médecine et de Chirurgie Pratique, Tome xxv., p. 529.

[2] Kœberlé: Opérations d'Ovariotomie. Paris, 1865, p. 142, and Plate vi., fig. 8, with explanation.

[3] J. Péan: Diagnostic et Traitement des Tumeurs de l'Abdomen et du Bassin. Paris, 1880, Vol. i., p. 12.

As appears from the tables at the end of the article, I have divided my material under two heads. The first class, designated as *operative cases*, comprises all those in which the diagnosis was made absolutely certain by operation or autopsy. As operative I have only counted such cases in which I have been able to *follow every step of the operation myself, and examine the cysts after removal both macroscopically and microscopically.* This alone enables the observer to tell with certainty from what kind of cyst a fluid comes. It is sometimes quite difficult even when the abdomen has been opened to tell the precise origin of a cyst, and after the operation has been performed, the character of the part removed may still give rise to controversy. Only by combining all the different means of investigation can we arrive at an irreproachable diagnosis.

In the same class I also include a few cases in which the tumor was not removed during life, but where autopsies offered the same opportunities for an exact diagnosis as in those operated on.

This class comprises fifty-eight cases; viz., fifty ovarian cysts, three cysts of the broad ligament, one uterine fibro-cyst (*myoma lymphangiectodes*), two cysts of the abdominal wall, one renal cyst, and one Battey's operation. At the last I was not present, but in this case there could be no doubt of the diagnosis, since I received the ovaries.

Another class comprises different *fluids removed by tapping.* Here the diagnosis is either as I got it from the gentlemen who treated the patients, or as I made it myself by examination of the fluids. In the former case, the diagnosis is put between quotation marks—" ". In this class the possibility of errors must be admitted, but there is no reason to doubt the accuracy of a diagnosis, made by the attending physician, of ascites from renal or cardiac disease, or of an abdominal tumor in a man, and in some cases the previous tapping was followed by an operation or autopsy, which settled the diagnosis.

It was indispensable to take tapped cases, in order to be able to compare the fluid with that of ovarian cysts, and see if the character found in the latter were of any diagnostic value.

This class comprises thirty-seven cases, supposed to be: fourteen ovarian cysts, three cysts of the broad ligament, one

peritoneal cyst with cancer of the omentum, one cyst of the liver, one renal cyst, one congenital cyst of the neck, one abdominal tumor in a man, one fluid from the thoracic cavity, one hydrocele, one liquor amnii, one blister from scalding, one congestive abscess of femur of five years' standing, five cases of ascites accompanying cancer of the abdomen, and five cases of simple ascites, due to cardiac or renal disease or cirrhosis of the liver.

Characteristics of Ovarian Cysts.—On ovarian cysts we commonly find the Fallopian tube much elongated, and sometimes considerably thicker than normal. It is usually united with the cyst by a distinct ligament formed by a double layer of peritoneum, the so-called *mesosalpinx*. But these characters cannot be used as a reliable basis of a diagnosis, as does Olshausen.[1] I have repeatedly seen the Fallopian tube left behind when an ovarian tumor was removed, so that the pedicle in this case only consists of the ovarian and part of the broad ligament. I have also (in case xxxiii.) found the tube imbedded in the wall of the cyst, the fimbrial end cut off.

The wall may be of very variable thickness. I have found it at least in some places as thin as the finest paper, and in others forming nodules more than an inch thick. It may in every respect be like a cyst of the broad ligament, but one thing is characteristic. It has always a complete *external layer of columnar epithelium*, except in places where it has been bound to other organs by adhesions, and in parts which have grown into the broad ligament, so as to be covered by the peritoneum. It has, likewise, an internal epithelium composed of columnar cells, but these are often in a high degree of fatty degeneration, or are missing in some places. Between these two epithelial layers, which are only observable by aid of the microscope, are uniformly found two layers of tough connective tissue bound together by looser material of the same kind. These two fibrous layers are very easily separated from one another, which is used as a valuable method to overcome adhesions too extensive to be severed, as recommended by Dr. J. F. Miner, of Buffalo. Sometimes the inner layer is subdivisible in two or more layers, but they are always less dis-

[1] Olshausen: Krankheiten der Ovarien, Stuttgart, 1877 (Billroth, Frauenkrankheiten, vol. vi., p. 148).

tinct. *The ovaries have no peritoneal covering* except quite near the hilus. The outer epithelium is entirely different from the flat endothelium of the peritoneum, and differs only from that found on the inner surface by being a little shorter, and by being always formed by one single row of cells.

We must distinguish between different kinds of ovarian cysts, the simple dropsy of a Graafian follicle, the myxoid proliferating cystoma, the dermoid cyst, the ovarian cyst with parovarian elements, the cysto-sarcoma, and the cysto-carcinoma.

1. *Hydrops Folliculi.*

This seems to be a rather rare form, as I have only met with one instance during this whole investigation. It was case xxxiii. The tumor was very large, containing at least a pailful of fluid. The wall was so thin that while full it was transparent, but when the cyst was emptied, it shrank very much. It had such adhesions in the pelvis that it could only be removed by enucleation, leaving a portion of the outer layer as large as a hand or more in the body. The sac was strictly monocystic, without any trace of proliferation whatsoever, nor of septa. It was white and bloodless, and looked entirely like a cyst of the broad ligament—so much more so as the tube was found imbedded in the wall of the cyst. No trace of ovarian tissue was to be found. Nevertheless, it was ovarian, first, because Dr. Thomas, who performed the operation, was unable to find any ovary beside it, although he looked carefully for it; and, secondly, because I found it covered with the columnar epithelium characteristic of ovarian tumors.

The fluid was limpid, slightly opalescent, foaming, not viscid. The specific gravity was only 1010. Reaction alkaline. It smelled of ether. No spontaneous coagulation took place in it, nor did it coagulate by boiling, nor by adding nitric acid; but by adding a drop of acetic acid a slight coagulation occurred, the fluid becoming entirely clear again by boiling with an excess of the same reagent.

The microscope revealed only a few granules, although the fluid was examined immediately after the operation.

In this case, then, the reaction for paralbumen—coagulation by boiling with a small quantity of acetic acid and redissolu-

tion by boiling with the same reagent in excess—would have been the only thing to indicate that the fluid came from an ovarian cyst.

The wall in collapsed condition was 1.5 mm. thick, and composed of the two usual layers, the outer being tough and white, the inner yellowish-red. They were bound together by uncommonly loose connective tissue.[1]

2. *Myxoid Proliferous Cystoma.*

This variety is by far the most common. The name has been given it by Waldeyer,[2] and forms a happy parallel to the old term *dermoid* cyst. It is derived from the Greek word $\mu\upsilon\xi\alpha$, mucus, and recalls the fact that the wall has the character of a mucous membrane, while in a dermoid cyst it has that of skin ($\delta\varepsilon\rho\mu\alpha$).

In the myxoid variety, the inner epithelium is at least partially composed of goblet-shaped cells. It is apt to form pouches, sometimes several rows of them, one below the other, and the underlying connective tissue is full of capillaries and embryonic elements. The differences in the epithelium and the underlying tissue cause the differences macroscopically observed between the two surfaces. The outer surface is smooth, comparatively hard, of a more or less white color. The inner is velvety, slightly uneven, of a reddish color. Sometimes we find yellow spots indicating fatty degeneration, or brown or gray patches indicating subepithelial hemorrhagic infarction. More rarely are seen incrustations of lime salts forming bony spiculæ. Often villous excrescences covered all over with epithelium grow from the inside.

Constantly ridges are seen running over the inner surface, marking the place where there formerly has been a septum, and commonly we find either several large cysts; or, if it be a so-called monocystic tumor, somewhere in the wall a small agglomeration of secondary cysts; for, as first pointed out by

[1] Of the three characters attributed to this kind of cysts by Virchow Verhandlungen der geburtshülflichen Gesellschaft in Berlin, vol. iii., p. 220), viz., size not exceeding the fist of man, complete coagulability by heat, and smooth wall, only the latter was present in this case.

[2] Archiv für Gynäkologie, vol. i., p. 254.

Virchow, all the unilocular cysts, except the simple enlargement of a Graafian follicle, are originally multilocular, and owe their present conformation to the absorption of the partitions separating the different cysts.

Physical Properties of the Fluid.—The color of the fluid found in myxoid ovarian cysts varies very much. I have found it very light yellowish-gray, greenish-yellow, yellowish-red, amber-colored, grayish-brown, dark-brown, like sugar syrup, *café au lait*, turbid port-wine, and molasses. It may be limpid as water and so filled with solid bodies as not to give passage to a ray of light through the bottle in which it is contained. Its consistence is usually more or less viscid, but sometimes it is very slightly or not at all so. The specific gravity expresses its density in a more exact way. I have found this varying from 1013 (case xxiii.) to 1062 (case xl.). The odor of the fluid is in many cases that of the ether used to produce anesthesia, in most it has a faint animal smell. Its reaction is slightly alkaline. In a single case only (xxxviii.), in which the fluid was purulent, and smelled strongly of butyric and kindred fatty acids, was the litmus paper turned red. As a rule the fluid does not form much foam, if any, on the top, but in one case (xxiii.) I found it as foaming as any ascitic fluid.

All these physical characters give the ovarian fluid a certain appearance by which an experienced eye recognizes it at first sight, and will not be mistaken in the great majority of cases; but there are exceptions. I take the viscidity to be the best of all physical signs when it is present, but we have seen that it may be wanting, and on the other hand it may exceptionally be present in other fluids. Thus Schroeder [1] reports a case in which the fluid was brownish, "fluorescent," of tough, ropy consistence, alkaline reaction, and specific gravity 1023. The following operation showed that it came from the peritoneal cavity, which was in a state of chronic inflammation. Péan[2] has described a rare disease of the peritoneum under the non-committal name of *maladie gélatineuse du péritoine*, which is characterized by the presence of a fluid like quince-jelly in a

[1] Schroeder: Krankheiten der weiblichen Geschlechtsorgane, Leipzig, 1874, p. 380.

[2] L. c., p. 418.

tissue as fine as cobweb, from which it breaks out by its own weight.

The specific gravity may be of some aid in distinguishing ovarian fluid from that of cysts of the broad ligament. It has no value in the differential diagnosis of ovarian cysts and ascites except in extreme cases. The color, limpidity, odor, and reaction are not characteristic.

Chemical Properties.—In spite of the strenuous efforts of Eichwald,[1] Scherer, Méhu,[2] and others, no test has been found by which the fluid from ovarian cysts can be distinguished from that of other fluids. Besides, the tests are so difficult to apply that only expert chemists can obtain reliable results. Not being of their number, I have not investigated this side of the question, excepting what relates to coagulation, which is a consequence of the chemical constitution of the fluid.

Coagulation may be spontaneous which is due to the presence of fibrin, or be produced by heat. Sometimes a drop of acetic acid added to the fluid, by counterbalancing its alkalinity, will considerably increase the bulk of the coagulum. This coagulum is composed of albumen or some of its derivates. Thornton says[3] that "if a fluid is more or less viscid, forms considerable coagulum on heating, which coagulum is either entirely dissolved or turned into a transparent jelly by adding an equal volume of strong acetic acid and continuing the boiling, this fluid is probably from an ovarian cyst. This is a test suggested to Mr. Wells for distinguishing between ovarian and ascitic fluid by the fact discovered by Scherer, that paralbumen is soluble in strong boiling acetic acid, whereas albumen is not." As this test is of easy application, I have tried it in every case except some of the first.

In my experience, as in that of Spiegelberg,[4] Westphalen, etc., the spontaneous coagulation or non-coagulation is of great value for distinguishing between cystic and ascitic fluids. As a rule, ovarian fluid does not coagulate spontaneously, ascitic fluid does. But what is said of ovarian fluid applies also to cysts of the broad ligament. In no case of cystic fluid exam-

[1] Eichwald in Würzburger Medicinische Zeitschrift, 1864.
[2] Méhu in Archives Générales de Médecine, 1869 and 1881.
[3] Med. Times and Gazette, May 13th, 1876, p. 519.
[4] Spiegelberg in Monatsschrift für Geburtskunde, November, 1869, vol. xxxiv., p. 385.

ined by me has there been a trace of spontaneous coagulation. I mean by cystic, coming from a cyst lined with columnar epithelium, for in case xxvi. which was a large cysto-sarcomatous tumor of the abdominal wall in a man, the fluid formed a large clot by standing. Other observers have come to a similar result in regard to the rule that ovarian fluid does not coagulate spontaneously, but the rule is not without exceptions. Westphalen [1] speaks of four cases observed respectively by Klob, Virchow, Spencer Wells, and himself, in which spontaneous coagulation took place in ovarian fluid. These will be examined in speaking of uterine fibro-cysts.

On the other hand, it is not rare that ascitic fluid does not coagulate spontaneously. It did not do so in tapped cases iii. (cardiac and Bright's disease), xii. (nephritis), and xix. (cancer of the peritoneum), but may be the coagulum had remained in that part of the fluid which was not sent to me. In tapped cases iv. (cancer of the omentum, mesentery and ovary), viii. (cirrhosis of liver), xxvii. (cancer of the omentum), and xxix. (ascites from unknown cause), the coagulum was quite small. Only in tapped case xiv. (cancer of the peritoneum) a large clot was observed, and that was only formed after a couple of days.

By boiling the fluid of ovarian cysts I obtained as a rule such a precipitation that the whole was entirely, or almost entirely, or at least to a great extent, transformed into a solid mass. There is only one case (xxiii.) in which the coagulation was slight in spite of addition of a drop of acetic acid. It may be that, in regard to coagulation, ovarian fluid differs from that of cysts of the broad ligament. In the first case of cyst of the broad ligament occurring in the list, this point was not examined, but of the two following, in case xi. no coagulation at all took place by mere boiling, and in case xii. it was very slight. In both coagulation appeared after the addition of nitric acid. In a case of a small cyst of the parovarium from a patient from whom Dr. Thomas removed a multilocular ovarian cyst from the other side, I found likewise no trace of coagulation by mere boiling, some with nitric acid, and much more with acetic acid.

The redissolution of the coagulum by boiling with excess of acetic acid, which should give us a means of recognizing ovarian fluid, has not proved reliable in my hands. I have used

[1] L. c., p. 84.

this test from operative case xv., and tapped case x. in every instance. In most cases the coagulum has, indeed, been more or less completely redissolved, but not only in operative cases xvii. and xviii. where there was much blood, but in operative cases xix., xliii., and xlvii., where there was scarcely any, it remained more or less completely unchanged. In operative cases xl. and xliv., it was only partly gelatinized.

On the other hand, the coagulum was more or less completely redissolved in tapped cases which were decidedly not cystic, but came from ascites with cirrhosis of liver (xxiii.), acites with cancer of the omentum (xxvii.), acites from unknown cause (xxix.).

There is a property which I do not find mentioned anywhere, which seems to have some really practical importance, and is intimately related to the chemical composition of the fluid. I mean its power of resistance to decomposition. Ovarian fluid has a wonderful capacity of keeping. It not only in a great measure retains its general appearance for a long while, but even the microscopical elements of which we are going to speak are often preserved for a very long time. Thus I re-examined, September 6th, the fluid of case xv., operated on May 15th, making an interval of almost four months, and found it full of Bennett's large corpuscles, Drysdale's small corpuscles with the shining granules, and columnar epithelial cells. In case xvi. the fluid, sixteen days after operation, had an offensive odor, dirty green color, and, nevertheless, it was found full of Bennett's corpuscles, Drysdale's corpuscles, columnar epithelium, and finely granular bodies with or without nucleus. In case xii., which was a cyst of the broad ligament, I repeated the examination four months and one week after the operation. The fluid was still clear, but from colorless had become orange-colored, offensive, and no elements were recognizable except a few granules bound together by a clear mass, and cholesterin. In another case the fluid, twenty-one days after operation, did look unchanged, but contained no traces of anatomical elements, nor bacteria. Ascitic fluid becomes turbid, and all elements are destroyed within a few days. In tapped fluid xiv., where my diagnosis of ascites with cancer was corroborated by laparotomy, the next morning very few elements were preserved, and the third, they were all gone. In

another case of simple ascites, ten hours after operation all epithelial cells were highly disintegrated, and next day no morphological elements were visible.

The test-tube and the spectroscope having failed to give us a means of diagnosticating ovarian cysts, and the physical characters giving only a more or less vague information, we will examine what the microscope can do.

Formed elements.—When a man for the first time looks at a drop of ovarian fluid through a microscope, he is perfectly bewildered by the number and variety of bodies he sees. When I began this study I was entirely unprejudiced. I did not take anything for granted. I had only seen that equally good men had come to diametrically opposite views on the diagnostic value of the fluids drawn from abdominal cavities, and I began, therefore, to study the fluid as if there never had been written anything on the subject. I had not even a nomenclature. I drew carefully what I saw, and described it so as to be able to recognize it. Later I made a careful study of what had been published on the subject, both in America and in Europe.

In the course of my study of the fluids themselves, I soon came to the result that all these many bodies we see in the microscope can be reduced to a few types. It is only by studying the cyst-walls, and especially by tracing the formation of cysts back to its very beginning, that we can come to understand the fluid contained in the cysts. Furthermore, the fluid ought always to be examined as soon as possible, for although it may often be recognized, as we have seen, after months have elapsed, still the elements undergo some change. The larger bodies break down to granules, and movement is arrested.

All the bodies seen in ovarian fluid are red blood-corpuscles, epithelial cells, nuclei, granules, pigment, finely granular globular bodies like lymph-corpuscles, or colorless blood-corpuscles, *pus corpuscles, spindle-shaped cells, cholesterin, and indican.*

Red blood-corpuscles are usually found. Sometimes they are so numerous as to be the preponderant element; in other instances they are few in number; and in some I have not found them in the specimens examined (operative cases xxiii., xxiv., xxviii., xxx., xxxv., xxxviii., xl., xliii., xlv., xlvii., lv.),

which of course is no proof that they were totally absent from the fluid, but it shows at least that they were rare enough not to be present in every drop of it. We cannot see by the color of the fluid if there are blood-corpuscles in it or not. A fluid may be light-colored and contain a large number in every visual field, and on the other hand it may be dark-brown and not show a single red blood-corpuscle (operative case xxiv.). Then the color is due to pigment in the shape of granules, or of larger, irregular masses, or inclosed in the dark variety of Bennett's corpuscles. The red blood-corpuscles appear with somewhat different shapes (see Fig. 1).

FIG. 1.—Red Blood-Corpuscles.

a, front view (7 to 9 μ in diameter)[1]; *b*, side view; *c*, crenated; *d*, same in side view; *e*, rosette-shaped; *f*, thorn-apple-shaped; *g*, hematoblasts, probably young red blood-corpuscles[2]; *h*, large red blood-corpuscles, without any distinction between centre and rim, some round, some slightly angular, some slightly serrated; *i*, red blood-corpuscle a day after operation, showing granules, recognizable by its color.

Epithelial cells are almost constantly found. When they are seen in front view (Fig. 2), they are more or less angular, varying in size from 11 μ to 34 μ. Some of them have a nucleus which may be considerably enlarged, others have none; but all contain finer or coarser granules due to fatty degeneration. Sometimes they are found in groups (Fig. 3). As a rule, they present themselves also in side view (Fig. 4), and then we see

[1] μ = micromillimetre, or one-thousandth of a millimetre. All the figures are magnified 400 times.

[2] Louis Elsberg: The Structure and Other Characteristics of Colored Blood-Corpuscles. Reprint from the Annals of the New York Academy of Sciences, vol. i., Nos. 9 and 10, New York, 1879, p. 14.

that they are columnar.[1] The nucleus, if there is any, has not a constant place near the lower end as in the fresh cells observed in young cysts, but is sometimes found midways, sometimes even near the upper end. This upper end is sometimes straight, sometimes convex, sometimes divided in fibrillæ. The lower end is always thinner, and ends usually in a small root.

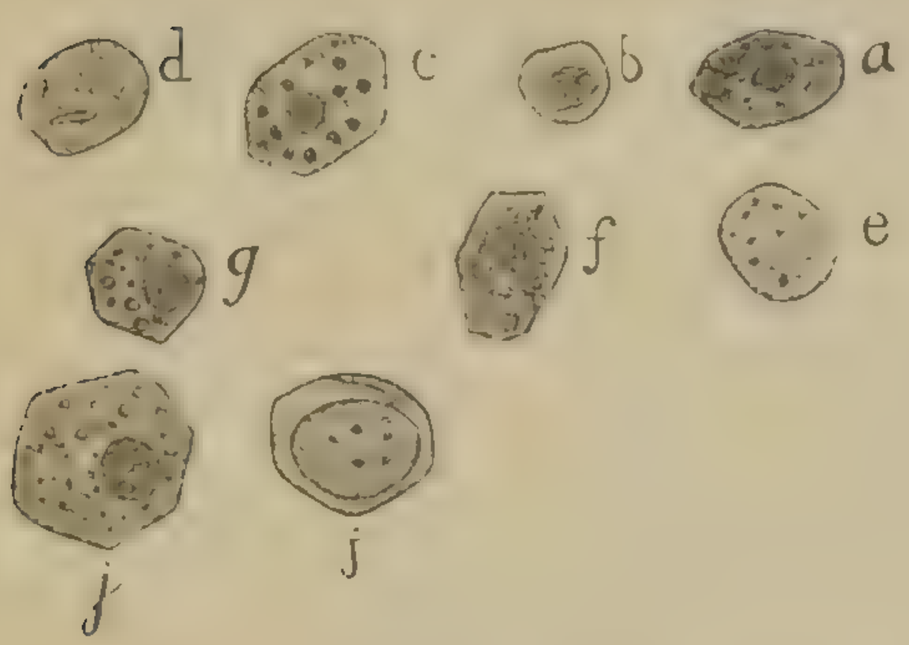

FIG. 2.—Epithelial Cells in Front View.

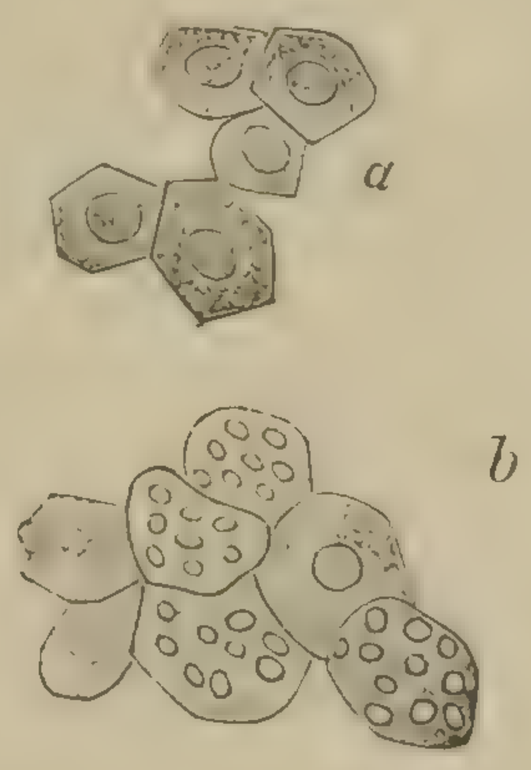

FIG. 3.—Groups of Epithelial Cells.

When the fatty degeneration reaches a high degree, the epithelial cells appear as so-called *gorged, or Bennett's corpus-*

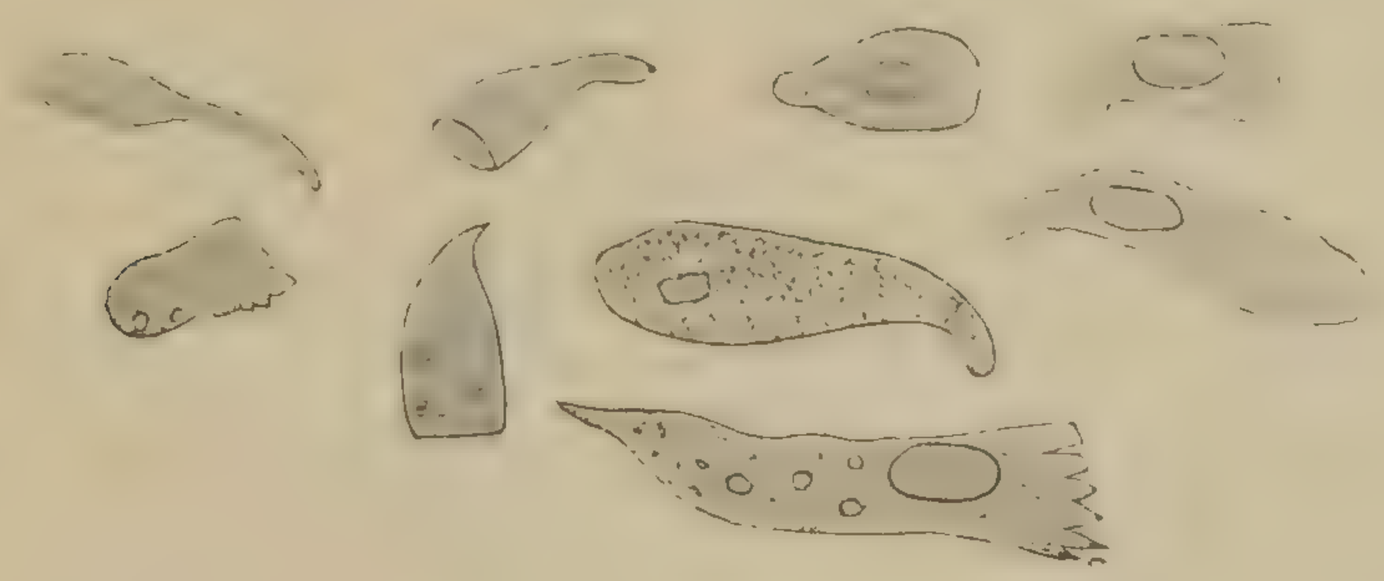

FIG. 4.—Columnar Epithelial Cells in Side View.

[1] It is strange that these cells are much oftener seen in front than in side view, although one would expect the contrary in bodies which have their greatest dimensions from top to base. Perhaps it is due to the greater compactness of the lower part distinctly observable in the cells, as long as they are young. Malassez and De Sinéty say (Archives de Physiologie, 1881, p. 227) they have occasionally found flat epithelial cells both in the fluid and on the walls. I have never found this, nor has Waldeyer, and I take it to be a diagnostic point of the greatest importance that ovarian tumors invariably are lined with columnar epithelium.

cles (Fig. 5). These are large granular cells, varying in diameter from 16 to 39 μ, roundish, or angular (*i. e.*, globular, or polyhedral), sometimes regularly pentagonal. They are more or

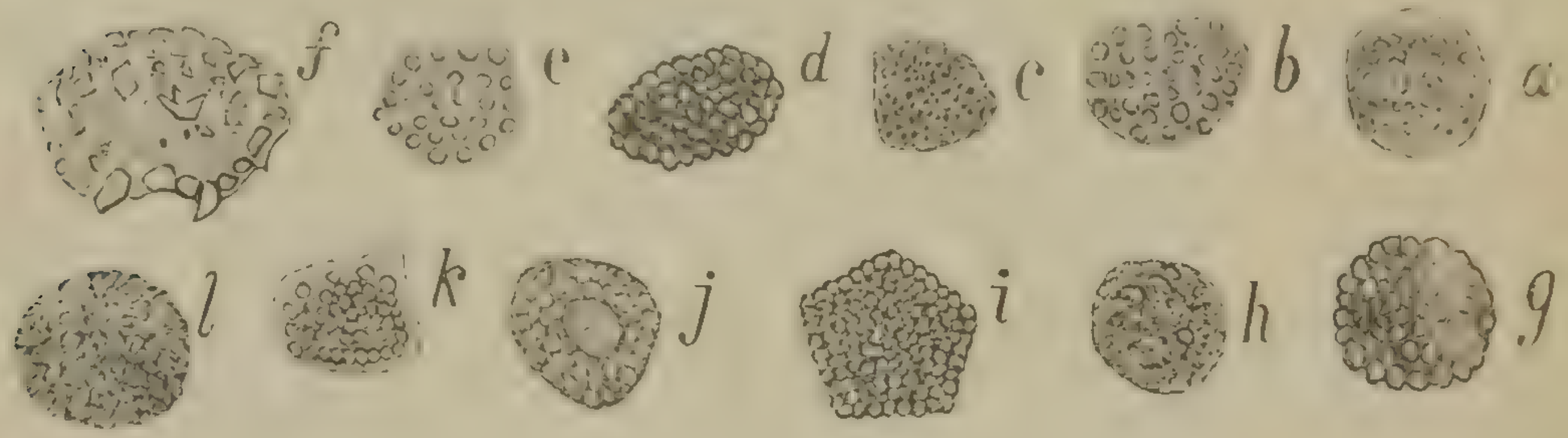

FIG. 5.—Bennett's Large Corpuscles, or Nunn's Gorged Corpuscles, *i. e.*, Epithelial Cells in Fatty Degeneration.

less filled with dark or shining granules. The shining granules are much larger than in the fatty nuclei we soon shall speak of. Sometimes a clear rim is found near the contour, and sometimes a nucleus is seen in the interior (Fig. 6.)

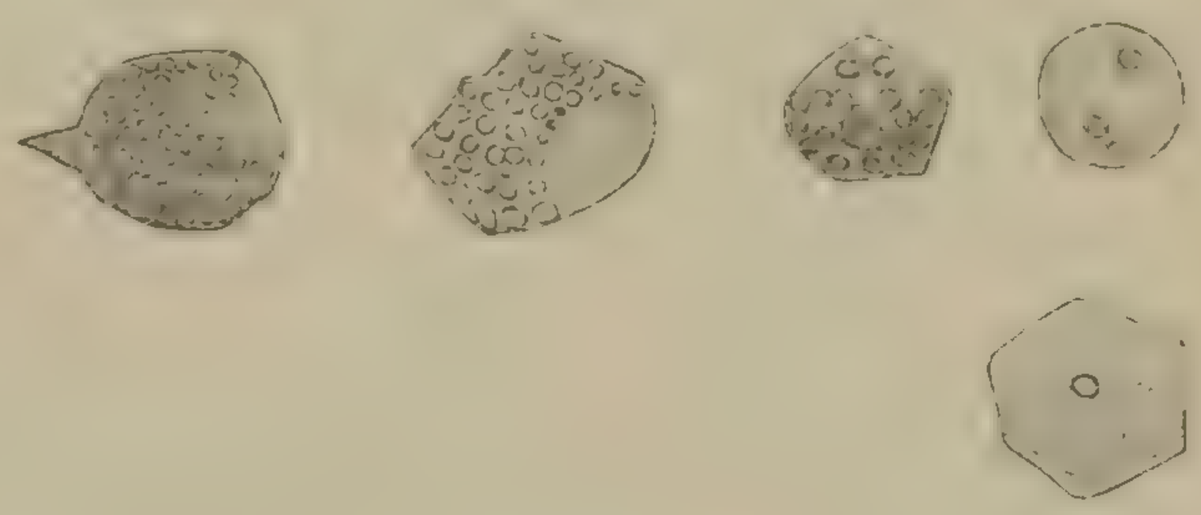

FIG. 6.—Transition from Epithelial Cells to Bennett's Corpuscles.

At other times one or more vacuoles are found in the epithelial cells (Fig. 7).

FIG. 7.—Epithelial Cells with Vacuoles.

FIG. 8.—Fragments of Bennett's Corpuscles.

This seems to be a kind of disintegration which will lead to their destruction, as we find it represented in Fig. 8.

Often we find a clear globule pushed out from the circumference (Fig. 9), and drawn in again shortly after. Perhaps such a globule sometimes becomes detached, and begins a separate life. At least these globules are entirely like some of those we find in the fluid, entirely structureless globular bodies, 11 to 16 μ in diameter, which may be called colloid corpuscles (Fig. 10).

FIG. 9.—Epithelial Cell with Appendix.

These are probably the same which Malassez and de Sinéty[1] call hyaline bodies; they say that they have been able to follow them into the interior of goblet-shaped cells, and hold them therefore to be products of secretion. They think that these small masses are fused together and form larger ones. Some of them they pretend can be seen with the naked eye, and are half a millimetre in diameter. I have never seen anything of the kind, and as they base their description on hardened fluid cut into sections, or at least on fluid stained with picro-

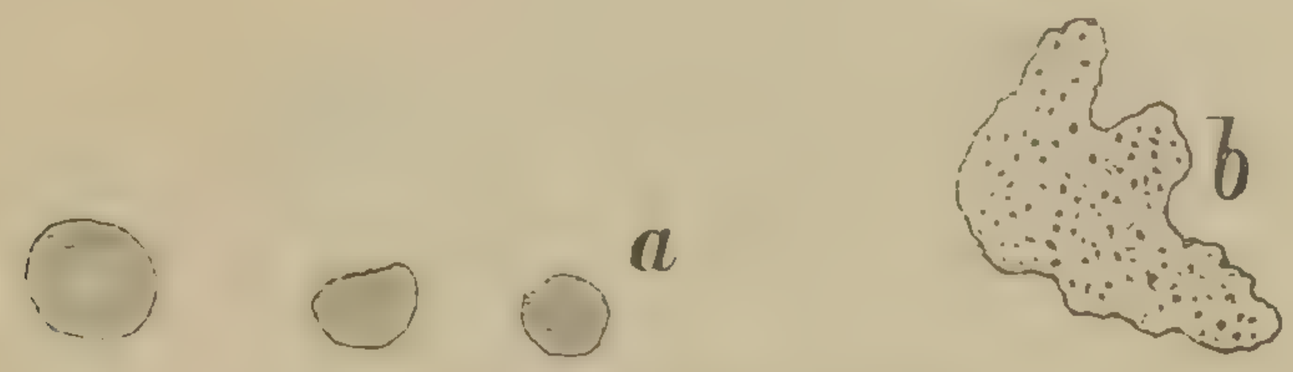

FIG. 10.—Colloid Corpuscles.

carmine, these bodies may be artefacts due to the effect of the chemical reagents employed. All my descriptions are based on observation of entirely fresh fluid without the addition of anything. I have also made sections of hardened fluid, but I have not found the bodies described by the named French authors.

There is another kind of colloid masses which I occasionally have seen. These are large, irregular, and have very fine

[1] L. c., p. 234.

opaque granules (Fig. 10, *b*). I take them to be altered epithelial cells.

There is also found a kind of bodies which Eichwald called *horn-cells* (Fig. 11); they are polyhedral, have sharp ridges, and look horny. Waldeyer[1] doubts their existence, and for a while I did so too. They might as well be some kind of accidental admixture; but in the first place they are found very commonly and, secondly, I once found (operative case xxiii.) three columnar epithelial cells sticking together, which were in a state of transition to horn-cells. The shape was yet visible, but the protoplasm was gone.

FIG. 11.—Horn-cells.

FIG. 12.—Ciliated Pus-corpuscle.

In none of my cases did I find *ciliated* columnar epithelial cells in the fluid, but in case vi. it contained ciliated pus corpuscles (Fig. 12), which can only be produced from a surface covered with ciliated epithelium. In the scrapings from the inner side of the cyst were also found numerous true columnar cells with cilia, as represented in Fig. 13.

According to Olshausen,[2] ciliated epithelium is characteristic of cysts of the parovarium, but in this case the tumor was not intraligamentous and the tube was not even removed. It has also been pointed out[3] of late that parts of the paro-

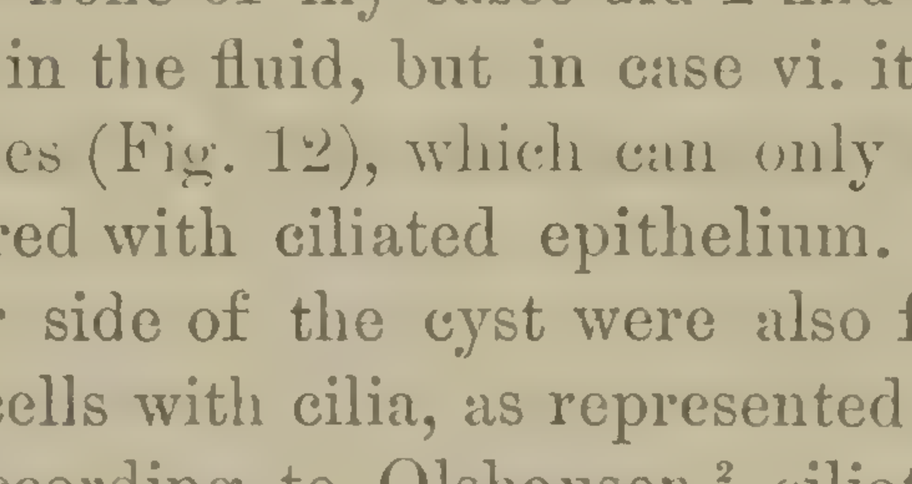

FIG. 13.—Ciliated Epithelial Cells.

FIG. 14.—Proliferating Cells.

varium extend normally into the substance of the ovary, by which a possibility is afforded of the formation of a cyst, lined with ciliated epithelium, in the ovary, as in my case (com-

[1] Archiv für Gynäkologie, i., p. 270.
[2] Olshausen, l. c., p. 51.
[3] Fischel in Archiv für Gynäkologie, 1879, Vol. xv., p. 215.

pare case li., a multilocular ovarian cyst with ciliated epithelium and watery fluid, which will be described separately, p. 43).

In a few cases (i., iv., x., xv., xvi.) I have found cells in proliferation (Fig. 14).

I admit that *a* (from case i.) might be due to a mere conglomeration of different bodies and impending breaking down of an epithelial cell, but not so with *b* and *c* (both from case xv., cystic myxo-fibroma); *b* presents very distinctly a large cell, with four large finely granular nuclei in the interior, and one with a nucleolus, forming a bud at the periphery. In *c* a distinct cell-membrane is visible. It is burst and the interior is full of bodies, of which some are already well-developed cells, while most of them still retain the character of granulated nuclei.

In quite fresh fluid it is not rare at all to find the epithelial cells surrounded by arms of cement substance, which constantly

FIG. 15.—Large Amœboid Bodies from Secondary Cyst.

change shape. I have seen this in cases x., xxi., and xxii. Besides this, in case x. I observed, both in the main cyst and in a secondary cyst, large *amœboid bodies*.

In Fig. 15 we see such a body represented in three consecutive shapes. In *a* we see two epithelial cells just connected by a narrow bridge. In *b* another bridge has been formed at the lower end, and the middle is taken up by a clear vesicle. In *c* the upper connection has extended to the full width of the two composing parts, the vesicle occupying the lower half of the whole body. The difference in the distribution of the solid parts in the different stages is also clearly shown.

Fig. 16 represents three epithelial cells from the main cyst, sticking together, changing shape and relative position, in three consecutive stages. The shining granules changed in

regard to place and number. Sometimes they were comprised within one of the prolongations sent out from the main body. In *c* the intermediate cell has moved down, and the two other ones have come in contact. Fig. 17 represents a cell of the same kind in a more advanced stage of fatty degeneration, a Bennett's corpuscle, the rim of which was possessed of amœboid movements.

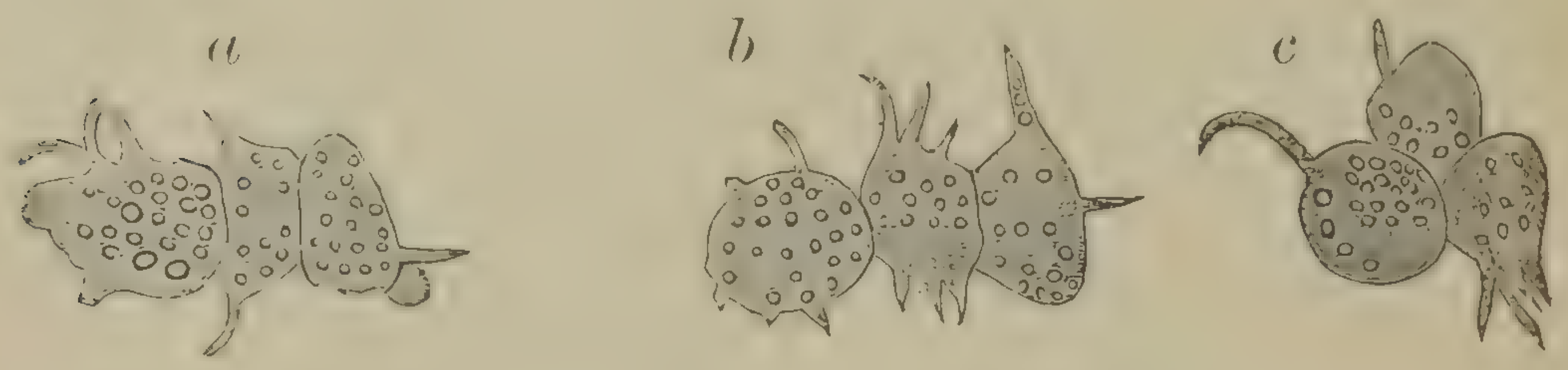

FIG. 16.—Three Epithelial Cells, with Amœboid Movements, from Main Cyst.

I found also *small* cells of the same kind with a few shining granules (Fig. 18). They were only 11 to 13 μ in diameter without the offshoots.

Finally, I found bodies exactly like colorless blood-corpuscles, with or without a nucleus, moving about and changing shape like those we find in ascites.

FIG. 17.—A Bennet's Corpuscle Posesssed of Amœboid Movements.

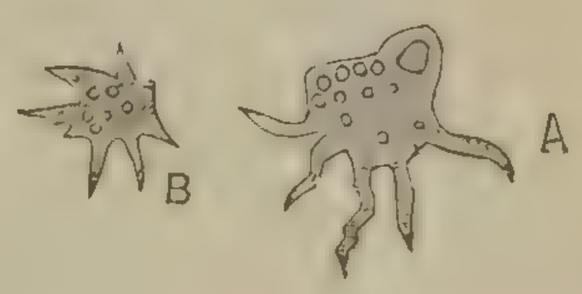

FIG. 18.—Small Amœboid Epithelial Cells.

All these amœboid corpuscles were only found in a single case, and have never been described by any one else. This was written in the early part of the summer of 1880, and the discovery was made April 3d, 1880, a year before Malassez and de Sinéty published their description of the fluid of ovarian cysts (*Archives de Physiologie*, 1881, second number). At page 233, they describe similar bodies under the name of "stellate and anastomosing cells." The only difference is that their cells each show a nucleus, which was not visible in mine, except in a transformed condition in Fig. 17. On the other

hand, theirs have not the large granules changing places and the network of threads uniting them in Fig. 15, *a*. They take them to be, not epithelial cells, but connective tissue cells. The difference in appearance is easily explained by my examination having been made on the living, moving cells, while they treated theirs with chemical agents which brought the nucleus in view. The discovery of amœboid cells is of importance, because the presence of amœbæ has been made a chief criterion by which to distinguish ascitic from ovarian fluid.

Besides red blood-corpuscles and epithelial cells in various kinds and degrees of metamorphosis, we find in ovarian fluid small bodies which are commonly known in this country as *Drysdale's corpuscles* (see Fig. 19). These are small, round-

FIG. 19.—Drysdale's Corpuscles, *i. e.*, Nuclei in Fatty Degeneration.

ish or slightly angular (*i. e.*, globular or polyhedral) clear bodies with a small number of shining granules placed at some distance from one another. They have no nucleus, nor does any appear on addition of acetic acid. Their size ranges from a little below a red blood-corpuscle to a little above a pus-corpuscle. These bodies are so well characterized by their shining granules that I do not find any difficulty in distinguishing them from ordinary pus-corpuscles. On the other hand, they cannot be distinguished from Lebert's *pyoid bodies*[1] by acetic acid, as recommended by Dr. Drysdale, for this is the very test indicated by Lebert for his bodies. "They have no nucleus," says he, "and acetic acid, although it makes them a little more transparent, does not affect them." His drawings of them are also identical with Drysdale's, but he says that he found these bodies in the peritoneum, in the synovial membrane of the knee, in congestive and metastatic abscesses, and often mixed with common pus-corpuscles, both in extravasations and in the false membranes on mucous and serous membranes.

[1] Lebert: Physiologie Pathologique, Vol. i., p. 46, and Atlas, Plate ii., Fig. 2,.Paris, 1845.

Another test has been indicated by which Drysdale's corpuscles are to be distinguished from Bennett's. Ether is said to dissolve the latter, while the former remain nearly unaffected by it, or at most have their granules made paler.[1] I have found ether a difficult agent to use for microscopical purposes. If you add it to the object you are looking at, it sets up so strong currents that the bodies are tossed about, and it becomes impossible to follow them. Ether may also be added to the fluid before the cover is put on. Then we see some of Bennett's corpuscles almost dissolved, and large fat globules which probably are formed by extraction of fat and evaporation of ether. But other corpuscles of the same kind are not affected at all, probably because they have not been reached by the ether, which mixes with great difficulty with the colloid fluid. On the other hand, Drysdale's corpuscles are affected in the same way as the large granular cells. They become pale, their contour becomes irregular, their granules disappear, they shrivel and seem to become dissolved. Thus ether affects both kinds of bodies or none at all. Since the one are epithelial cells in fatty degeneration, and the other their nuclei in the same state, as will soon be proved, it is easy to understand that there cannot be any marked difference in the effect ether has on the two kinds of bodies.

I have tried a one-per-cent solution of *osmic acid.* It is said to have the property of staining fat black. I found, indeed, that it made the contour of the granules in Drysdale's corpuscles darker, leaving the clear part unchanged, but I found that it had exactly the same effect on the large granular cell, and gave also the free granules, swimming in the fluid, a black outline. Furthermore, I found that in well-preserved epithelia it stained the outline of the body and of the nucleus, leaving a clear space between the two. Also the contour of red blood-corpuscles became black. Thus this agent is of no use. Either it stains other substances than fat, or else fat is found in all the corpuscles in the fluid.

The only corpuscles in ovarian fluid I have found it really difficult to distinguish from Drysdale's so-called "ovarian granular cell," are thorn-apple or rosette-shaped red blood-corpuscles, the knobs on the surface of the latter, seen from above, giving

[1] Drysdale, Reprint, p. 5.

an appearance which is very like that of the shining granules in the interior of Drysdale's corpuscles. But, by paying close attention, we will find the contour of a rosette-shaped blood-corpuscle scolloped, while that of Drysdale's corpuscles is even.

There is, furthermore, a great variety of small *bodies without nucleus and with fine, dark granules* (Figs. 20, 21, 22, *a*, *b*), and some of a similar appearance with a nucleus (Figs. 23

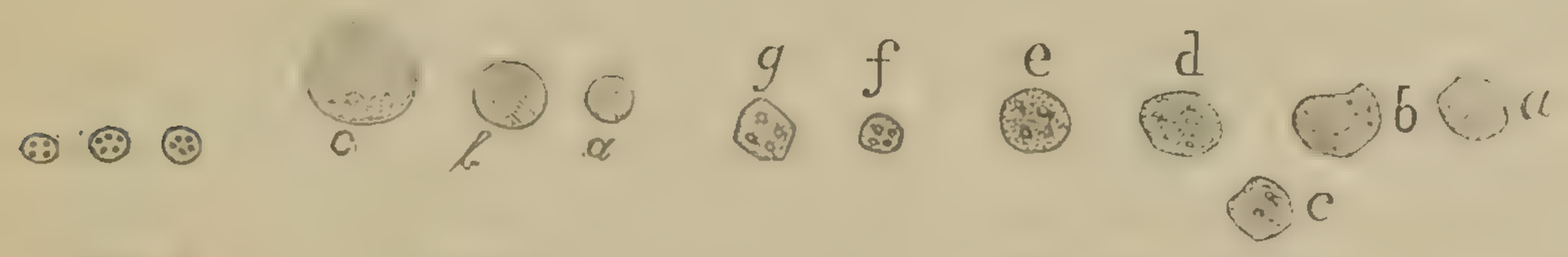

Fig. 20. Fig. 21. Fig. 22.

Transition from Nuclei to Drysdale's Corpuscles.

and 24). I hold most of these bodies to be nuclei of epithelial cells, which undergo fatty degeneration. They vary in size from 5 to 16 μ, and attain exceptionally still larger proportions. Some of them are probably colorless blood-corpuscles or lymph-corpuscles. Nuclei may be as large as cells, but on addition of acetic acid the body of the latter is cleared up, and a nucleus appears if there is any.

Fig. 23. Fig. 24.

Cells with Fine, Dark Granules and Nucleus (Enlarged Colorless Blood-Corpuscles ?)

Pus-corpuscles (Fig. 25) composed the whole fluid in case iv., a suppurating ovarian cyst. They were in more or less fatty degeneration. In case xxxviii., the fluid looked also like pus and indeed contained pus-corpuscles, but the majority of bodies could be recognized as ovarian elements. The examination of the wall showed that suppuration had only set in on a small portion, measuring about four centimetres square. In other fluids I have not found anything that especially merited the name of pus-corpuscles, for it must be remembered that these cannot be distinguished from lymph-corpuscles or colorless blood-corpus-

cles, and are, in fact, the same thing. Only when so many of them are produced as to form the greenish-yellow fluid we call pus, can we speak of pus-corpuscles. Some pus-corpuscles in real pus are not at all dark and filled with protoplasm, clearing up by acetic acid, and exhibiting from one to four nuclei, as they are commonly described and drawn. They may be quite pale, and change very little on addition of acetic acid. Many of this kind were found in case vii., which was a suppurating cyst of the abdominal wall. The size of pus-corpuscles is about 11 μ.

Next we find in ovarian fluid all sorts of *granules* of protoplasm, fat, or pigment. If some time has elapsed since the fluid was withdrawn, we find more granules, the larger bodies being gradually disintegrated, but many fresh fluids are also full of them.

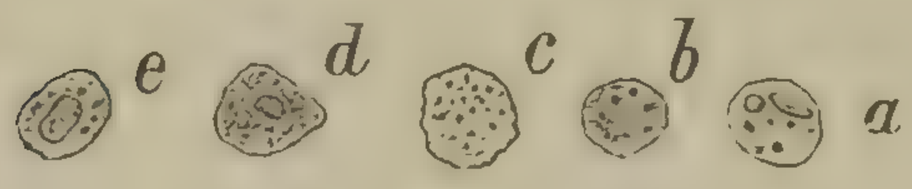

FIG. 25.—Pus-Corpuscles.

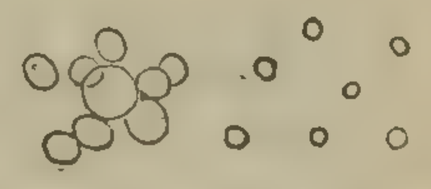

FIG. 26.—Fat-Granules.

Fat-granules are known by their sharp, round contour, and by being highly refracting. The pigment is usually yellow or brown.

In a single case (xv.), in which the wall in many places showed the pretty arrangement of myxomatous tissue interspersed in dense fibrous tissue reaching a thickness of a centi-

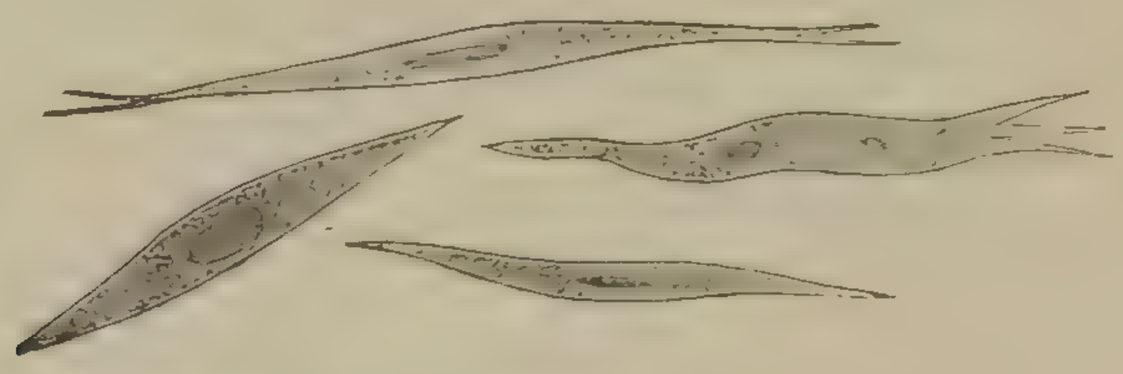

FIG. 26 *bis*.—Spindle-shaped Cells.

metre, I found numerous *spindle-shaped cells* (Fig. 26 *bis*). Sometimes the end was split in two or three fibrillæ. Some of them showed an oblong or rod-shaped nucleus. Similar cells were found in parts of the wall. In the same case were found large epithelial cells with vacuoles as in cancer, and large cells with endogenous proliferation (Fig. 14, *b*, *c*).

Finally we sometimes find (xxi., xxiv., xxviii., xxx.) crystals of *cholesterin* (Fig. 27), or *indican*, small, angular, solid bodies of a beautiful blue color.

Origin of formed elements. The correctness of the assertion made above, that Bennett's corpuscles are really epithelial cells in fatty degeneration, is proved by the fact that we find all degrees of transition from one to the other in the fluid, as shown in Fig. 6, and still more conclusively by this other fact that, on

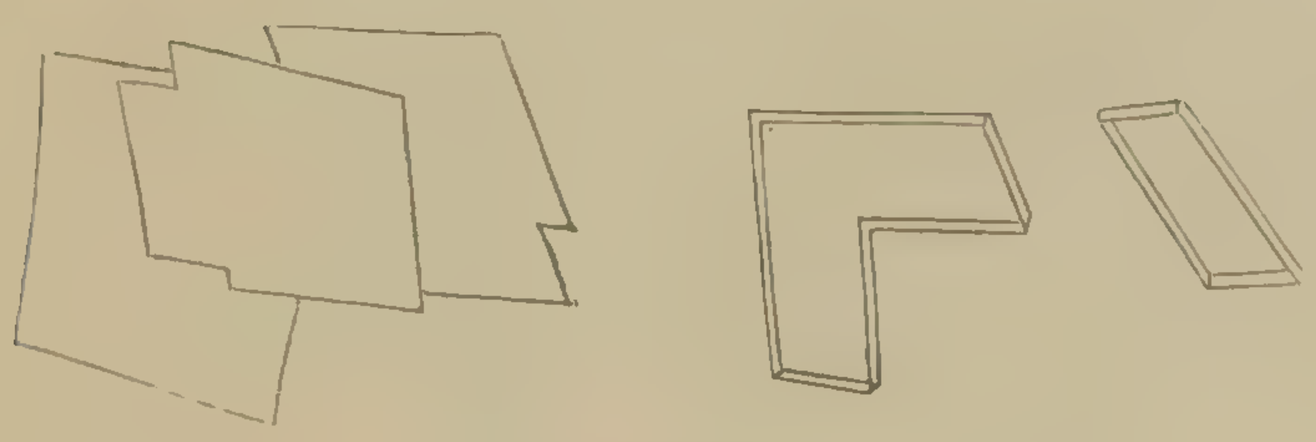

Fig. 27.—Cholesterin.

examining the epithelial lining of an ovarian cyst under the microscope, we again find all these transitions from a comparatively fresh epithelial cell to a well-developed Bennett's corpuscle going on in the epithelial lining itself.

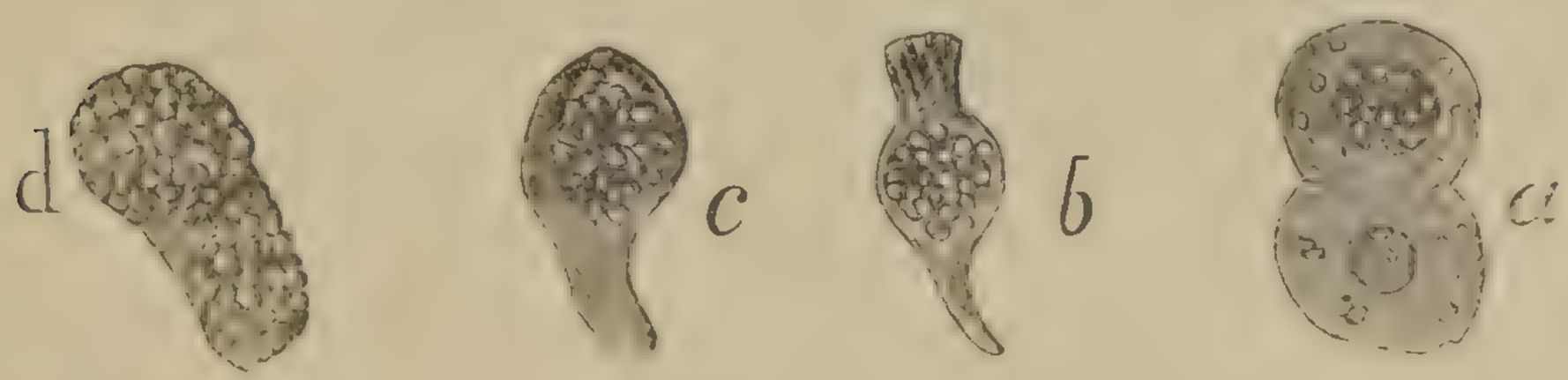

Fig. 28.—Epithelial cells, the nuclei of which are being transformed to pigmented Bennett's corpuscles; *a*, two in front-view; *b*, *c*, two in side-view in different stages of development; *d*, the whole cell is filled with yellowish-green granules; a line in the middle indicates yet the boundary of the nucleus.

The kind seen in Fig. 5, *l*, is composed of dark pigment-granules closely packed together. This pigmented variety is developed in a particular way. The process begins at the nucleus of the epithelial cell which becomes enlarged, dark-colored and coarsely granular. By-and-by it increases so much that it fills the whole cell. I observed all these transitions in a secondary cyst in case xxxi., from which the drawings are taken (Fig. 28).

Sometimes two or three such enlarged epithelial cells with enormously enlarged dark nuclei yet stick together, and then they form such bodies as have been described by Eichwald as "colloid globules inclosing several rounded granulated agglomerations."[1] I have only found these in young cysts, say of the size of a walnut, never in the tapped fluid from large cysts.

The common process of fatty degeneration of the epithelial cell appears first as fine dark granules in different parts of the body of the cell. Later they become larger and clearer, and the cell itself becomes much enlarged. Usually the nucleus is destroyed, but it may still be visible (Fig. 5, *j*).

If instead of examining old cysts we direct our attention to the very beginning of the formation of a microscopic cyst in

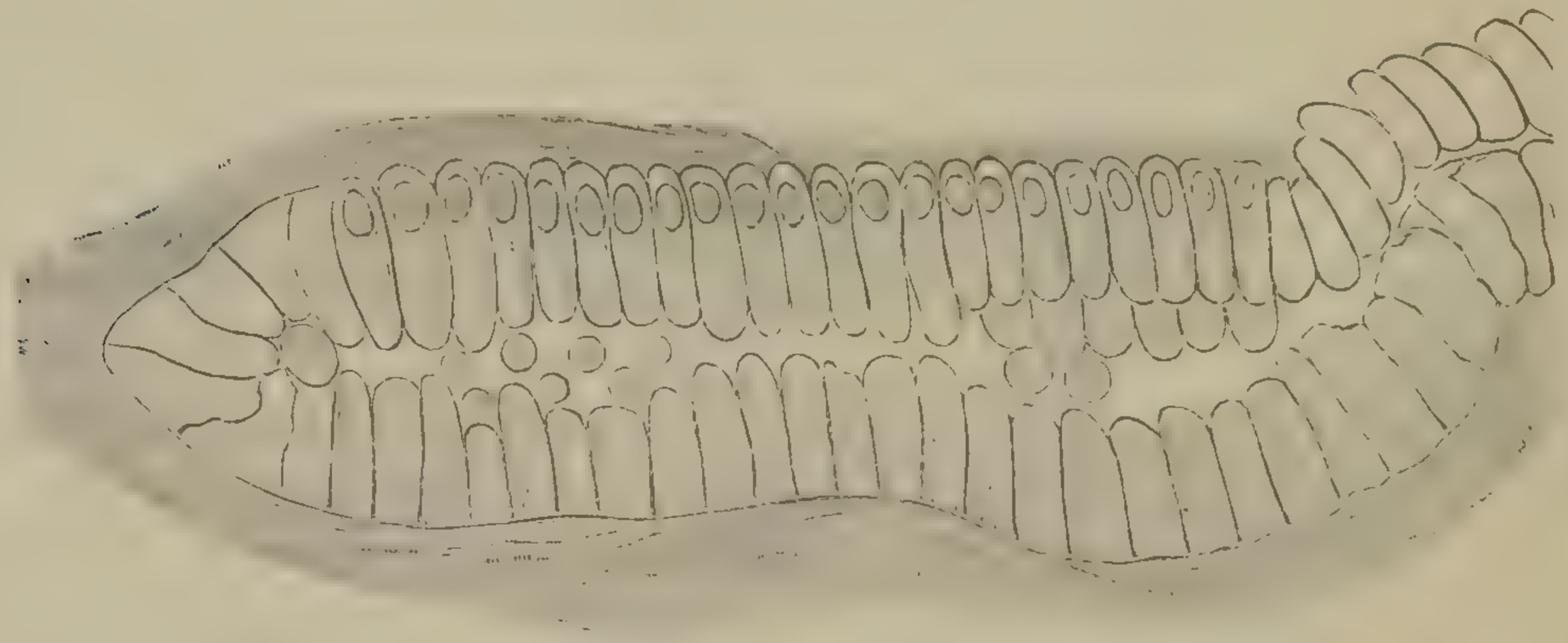

FIG. 29.—Beginning Secondary Cyst-formation.

the centre of one of the epithelial pouches which are developed from the epithelium lining the inside of the main cyst (Fig. 29), we find another process.

The cavity is still so small that the opposite walls almost touch one another, and it contains exclusively colorless bodies without shining granules (Fig. 21, *a*), and corresponding entirely in size and shape with the nuclei seen in the surrounding epithelial cells. They are only 4 to 5 μ in diameter. In another of these minute cysts (Fig. 30), the cavity of which is a little larger, we find also larger bodies, but still of the same kind, without trace of shining granules.

The finely granular bodies are here somewhat larger, either circular with a diameter of 7 μ, or oblong, measuring 7 by 11 μ. One of them has a nucleolus. At the same time we notice

[1] Spencer Wells: Diseases of the Ovaries, p. 99.

in the wall a much enlarged epithelial cell with nucleus and nucleolus. This nucleus corresponds perfectly in size and appearance with the bodies swimming in the cavity.

In these minute cysts, then, a melting process is going on by which the bodies of the epithelial cells are dissolved and the nucleoli set free. If we examine young secondary cysts which are large enough to form macroscopical tumors, say of the size of a hazelnut, we may find whole masses of the epithelial lining thrown off and forming flakes in the fluid. In due time these will also be dissolved and their nuclei set free. The nuclei may later undergo fatty degeneration, and then they become Drysdale's corpuscles.

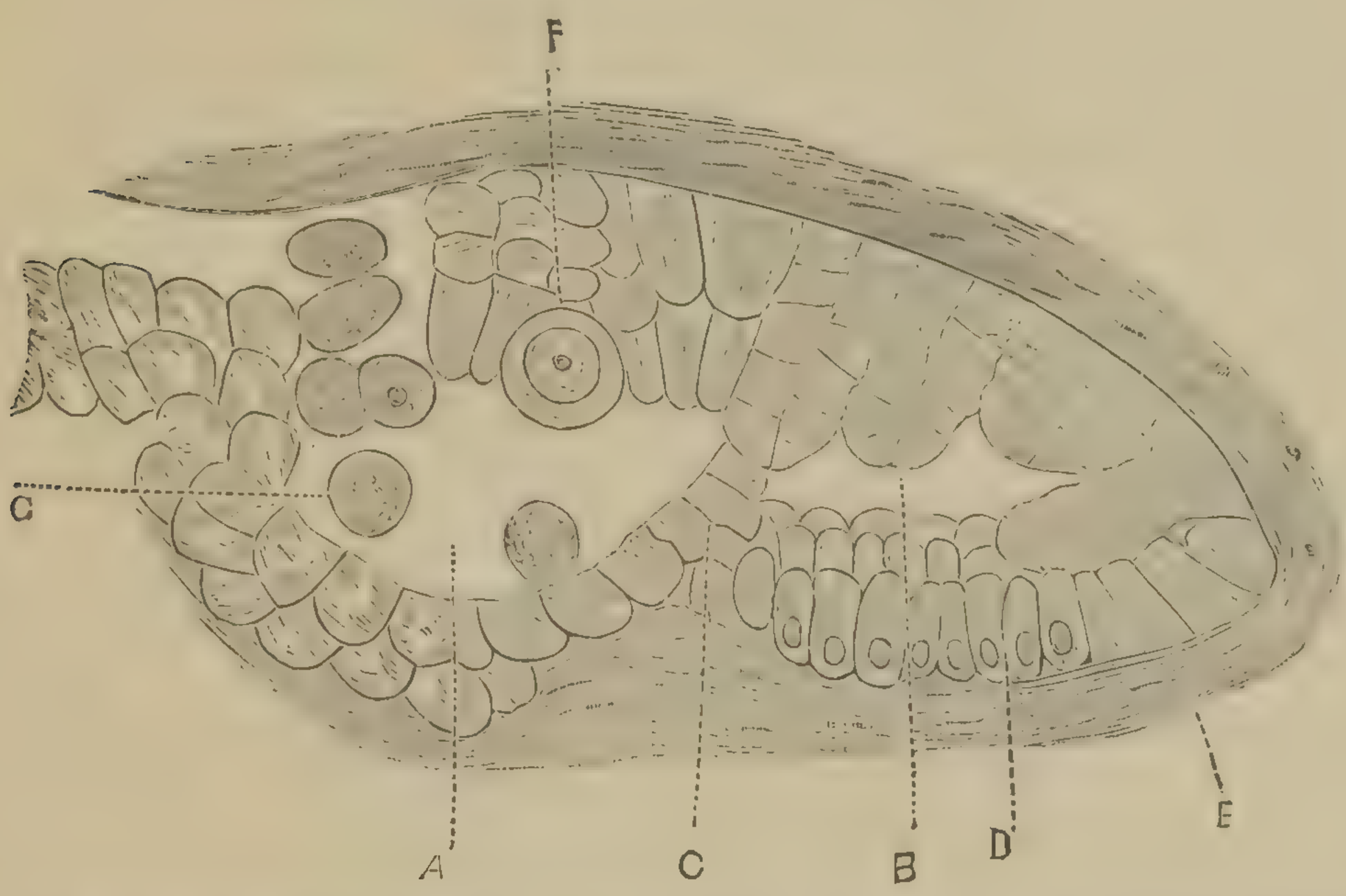

FIG. 30.—Cyst-formation a little more advanced; A, B, two minute cysts partially separated by a ridge C, lined with goblet-shaped epithelium (D); E, connective tissue; F, enlarged epithelial cell; G, finely granular bodies corresponding in size with the nucleus of the large cell.

It will be seen that I do not regard Drysdale's corpuscles, as he does himself, as cells. His first paper is entitled "On the Granular *Cell* found in ovarian fluid," and in the discussion in the American Gynecological Society alluded to above he called it "a cell characteristic of ovarian fluid."[1] I do not see any reason why this corpuscle should be looked upon as a cell, its most distinctive character being never to have a nucleus, while this peculiarity is quite easy to understand when it is itself a

[1] Amer. Gyn. Transact., 1876, vol. i., p. 195.

nucleus. This nucleus is in fatty degeneration, as proven by the clear shining granules in its interior, but this degeneration is first produced in the course of time. In microscopical secondary cysts we never find Drysdale's corpuscles, while we very rarely miss them in the main cyst. It might be asked why Drysdale's corpuscles as a rule are found in much larger number than Bennett's. I believe this is chiefly due to their being nuclei which have greater power of resistance than the cells. The cells easily break down and form the innumerable host of granules we are sure to find in every ovarian fluid. Exceptionally the proportion may be reversed. In case xliii. there were a great many of Bennett's corpuscles and only few of Drysdale's. But whenever there are unusually many of the one, there is a corresponding decrease in the number of the other class.

It appears from the above that I take most of the bodies with fine dark granules, which form so large a part of ovarian fluid, to be nuclei of epithelial cells; but on the other hand several other sources may be indicated from which some of them are likely to derive. Thus, since we almost constantly find red blood-corpuscles in ovarian fluid, we may fairly conclude that there is a corresponding number of colorless blood-corpuscles, say about one for every three or four hundred of the red.[1] Sometimes the wall of ovarian cysts is so crowded with granular cells under the epithelium that it does not seem unlikely that some of them may break through the thin gelatinous barrier and become free inmates of the cavity. Finally the endogenous proliferation we have mentioned above, seems also sometimes to furnish a contingent to the grand army of nondescript granular bodies. Mostly they have no nucleus, which tallies well with the supposition that they are themselves nuclei. Sometimes they have indeed a nucleus (Figs. 23 and 24), but these cells, of rather rare occurrence, are then different from the other bodies, may be they are colorless blood-corpuscles or connective tissue cells, or cells formed by proliferation.

In case xxxii. I observed directly the identity of Drysdale's corpuscles, the colorless bodies with fine dark granules without nucleus, and the nuclei of the epithelial cells. It was the sec-

[1] Funcke: Lehrbuch der Physiologie, 4th ed., Vol. i., p. 19, Leipzig, 1863.

ond ovary of an old woman of sixty-eight years. One ovary was developed into a large polycyst, the other formed a small tumor about the size of an egg (5 × 4 × 4 centimetres), with transparent walls, and composed of a few large cysts. The largest, which had formerly been two, as shown by the remnants of the septum, contained a fluid ounce of very thick, colloid, yellow-

FIG. 31.—Flakes of Epithelium, the Cells melting and setting the Nucleus free.

gray fluid. In this fluid swam flakes of epithelium large enough to be seen with the naked eye. Some of these flakes showed still indistinct outlines of cells, some of which had a nucleus identical with Drysdale's corpuscles in the surrounding fluid (Fig. 31). In other flakes, most cells were no more

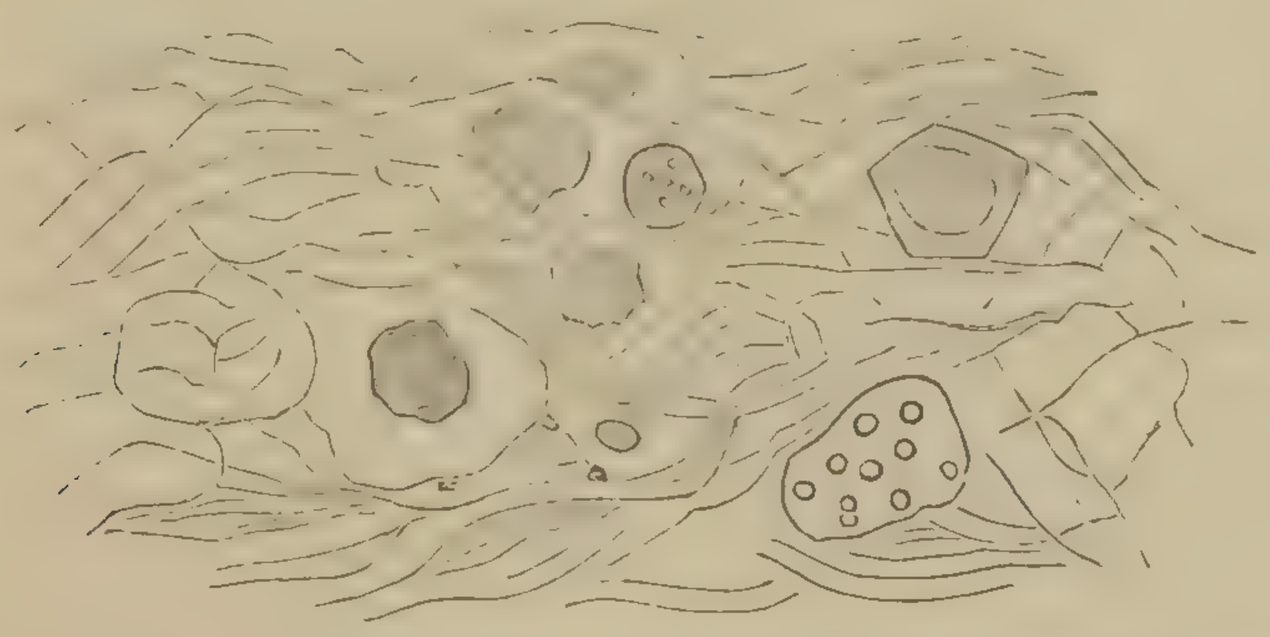

FIG. 32.—Flake of Epithelium, the Cells mostly changed to a Thready Mass with Nuclei.

recognizable as such. They had been dissolved and blended together to a thready mass, with large holes in it. In this mass and in these holes were found nuclei, some of the finely granular semi-opaque variety, others with shining granules, *i. e.*, Drysdale's corpuscles. In a few places the nucleus could yet be seen imbedded in an epithelial cell, or a cell was found

without nucleus, but with large, shining round granules, *i. e.*, changed to a Bennett's corpuscle (see Fig. 32).

The *pigment* which is found as granules, or in larger masses, or incorporated in Bennett's corpuscles is easily referable to the coloring matter found in red blood-corpuscles. In the walls of ovarian cysts we almost constantly find large infarctions of extravasated blood in different degrees of disintegration. When, in the course of time, in consequence of the destruction which is constantly going hand in hand with the new growth in the wall, these strata are opened and carried into the fluid, the pigment swims around in granules or is taken up by cells and incorporated until they become what I have called the dark variety of Bennett's corpuscles. The blood may also be poured directly into the fluid by the bursting of a vessel.

As to the pale, structureless grayish discs which we sometimes find, and which, for want of a better name, may be called *colloid* corpuscles, it is difficult to say what they are. Some of them may be red blood-corpuscles, of which a large amount of the interior contents have been thrown out as described by Dr. Elsberg.[1] Others may be parts of epithelial cells (Fig. 9)

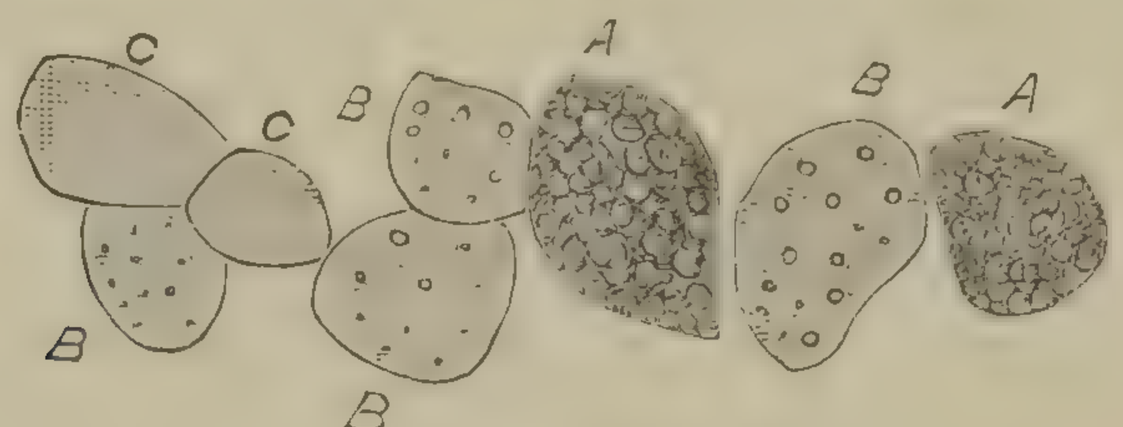

FIG. 33.—Group of Epithelial Cells undergoing various Changes.

AA, Yellow-green Bennett's Corpuscles; BB, Epithelial cells, with a few small, shining globules, and many dark ones; CC, Barely visible, structureless, still angular cells.

which have become separated from the parent body. But most of them, I suppose, are changed epithelial cells. I am led to believe this by having seen whole flakes composed of such bodies, which then, of course, were still more or less angular, and at other times groups, in which some cells exhibited a few fat-granules, others were changed to dark Bennett's corpuscles, and still others were entirely structureless and pale, like the colloid bodies (Fig. 33).

[1] L. c., pp. 48–49.

Thus we see different processes—the fatty degeneration, the colloid degeneration, and the absorption of pigment go hand in hand.

Diagnostic value.—When we look over the above list of anatomical elements, we do not find a single one which is always found in ovarian cysts and nowhere else. In other terms, *there is no pathognomonic morphological element in ovarian fluid;* but it would be a very hasty conclusion if we were to infer that the microscopical examination of the fluid is worthless. When once we know the limits of our knowledge in this respect, we will find the microscopical examination of the fluid a very valuable help; nay, when combined

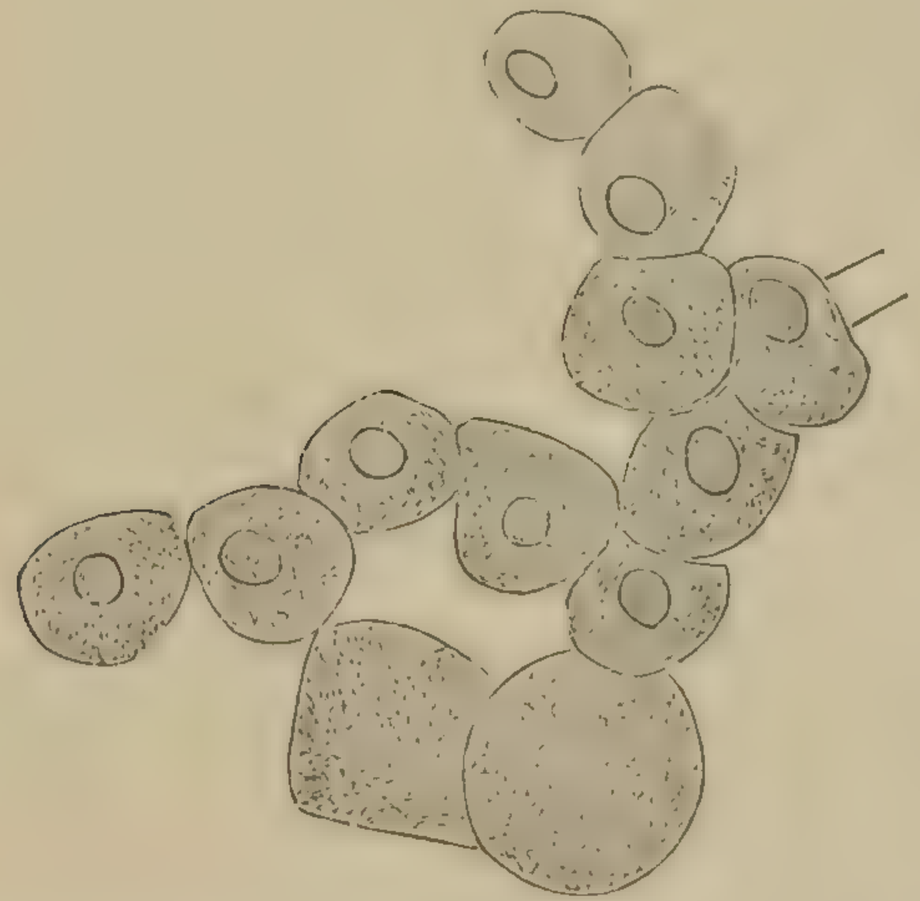

Fig. 34.—Flake of Peritoneal Endothelium in Mixture of Ovarian and Ascitic Fluid.

with other signs, the character of the fluid is the most conclusive of all that lead us in our diagnosis of an ovarian cyst.

The most important elements are columnar epithelial cells seen in side-view.[1] In front-view they may be so like endothelial cells from serous surfaces that they are difficult to distinguish.

In case xxxix., fluid from a myxoid ovarian cyst had poured into the peritoneal cavity through the opening made in with-

[1] I use the expression columnar epithelium as a general term for cells which have greater depth than width. Examined in fresh condition, especially in quite young cysts, we find them goblet-shaped, with the nucleus near the bottom.

drawing a small quantity with an aspirator. Here large flakes were seen which were easily recognized as belonging to the peritoneum, the cells being more roundish and less polygonal than ovarian epithelial cells are when grouped together, and having a nucleus which was much smaller in proportion to the body of the cell (Fig. 34).

But in other flakes the cells had no nucleus, but contained many fat-globules. In this state they become so like Bennett's large ovarian corpuscles that they cannot be distinguished from them. The examination of pure ascitic fluid has led to the same conclusion.

The beginner must be warned not to mistake flat endothelial or epithelial cells seen in side view for columnar epithelial cells. The former are more or less pointed in both ends (see Liquor Amnii, Fig. 48), while the columnar epithelial cell is always much wider at the upper end than at the lower (see Fig. 4). Cells which, seen in front view, present a long and narrow surface, may also be taken for columnar epithelial cells in side view, but usually the lower end of these latter is so thin that it forms a small root, and the nucleus is seen much more distinctly than from above, when, as a rule, it cannot be seen at all in the state of more or less advanced fatty degeneration, in which we find the epithelial and endothelial cells swimming in abdominal fluid.

I am surprised to see that Dr. Foulis[1] declares that he has not found epithelial cells in the examination of about eighty different ovarian fluids. I have almost always found them. When we find them, we may conclude that the fluid is contained within a cyst lined with columnar epithelium, and not in a serous membrane like the peritoneum,[2] nor in a cavity with-

[1] Edinburgh Med. Journal, March, 1875, p. 843.

[2] Since the ovary is covered with columnar epithelium, the possibility of the appearance of cells of this kind in ascitic fluid cannot be denied, but it has never been found, as far as I know, and the chances of its appearance in a drop of fluid are exceedingly small when we think of the size of the normal ovary and the enormous quantity of fluid often contained in the peritoneal cavity. If the ascites is combined with an ovarian cyst, the chances of the appearance of columnar epithelial cells in the ascitic fluid, even without rupture, by mere abrasion from the surface of the enlarged ovary, would be considerably greater, but in the only case of the kind I have examined (operative case xxv.), the ascitic fluid contained only flat endothelial cells.

out epithelium, as some uterine fibro-cysts, but we cannot conclude that it is ovarian. It may as well be a cyst of the broad ligament or, perhaps, dropsy of the Fallopian tube. If the epithelium be ciliated, this will not help us, for cysts with this variety of epithelium are found in the ovary, as we have seen above (p. 20), and, on the other hand, cysts of the broad ligament may have columnar epithelium without cilia (case xi.).

Bennett's corpuscles have no diagnostic value, not even to distinguish cysts from other cavities. I found them in two of my cases of cysts of the broad ligament (operative cases xi. and xii.), in a case of a cystic, cancerous tumor of the abdominal wall in a man (operative case xxvi.), in a case of cancer of the peritoneum (tapped case xiv.), where my diagnosis, based alone on the characters of the fluid, was confirmed by laparotomy. Likewise, in tapped cases i. and ii., the first of which was cancer of the peritoneum, as ascertained by operation and autopsy by Dr. H. K. Bennet, of Fitchburg, Mass., and the second, a tumor in the abdominal wall of a man. These corpuscles seem also to be exactly like those described under quite different circumstances by Gluge, and later by Paget,[1] who takes them to be altered lymph-cells.

Epithelial cells, in which some degree of fatty degeneration is found, but not enough to constitute Bennett's corpuscles, I have found in a case of ascites from cardiac and renal disease (tapped case iii.).

On the other hand, I missed Bennett's corpuscles in one case of ovarian polycyst (operative case xxvii.).

Drysdale's corpuscles seem to have a little more value than Bennett's, but they are by no means pathognomonic, not even of the presence of any kind of cyst, and still less of an ovarian cyst. I have found them in one of my cases of cyst of the broad ligament (v.), in a case of suppurating cyst of the abdominal wall (vii.), in the above-mentioned case of cancer of the peritoneum (tapped case i.), in a case of renal cyst (tapped case xxxii.), in a congestive abscess extending from the spine to the femur (tapped case xxxiii.), and in a vaginal cyst.

Similar observations have been made by others. Dr. A. Erich, of Baltimore, has found these corpuscles in a case of

[1] Paget: Lectures on Surgical Pathology, 3d ed., London, 1870, p. 283.

encysted ascites.[1] The diagnosis of "the ovarian cell" had been made by Professor Brown, "a microscopist of experience." They were likewise declared to be present by "the microscopist," and by Dr. S. Bunker, member of the committee on Microscopy in the Pathological Section of Kings County Society, in a case of Dr. J. Byrne, of Brooklyn, which turned out to be hobnailed liver with ascites.[2]

On the other hand, I have missed these corpuscles in cases of simple ovarian polycysts (operative cases vi., xxxvii., xliii., li.), in another where the cyst-wall showed cancerous degeneration (xiii.), and in a case of sarcomatous cyst (xlviii.).

The bodies with fine dark granules which resemble lymph-corpuscles or colorless blood-corpuscles have no significance whatever. I have found them under the most various circumstances: ascites with ovarian cyst (xxv.), ascites with cardiac and renal disease (tapped case iii.), ascites from nephritis (tapped case xii.), ascites with cirrhosis of liver (tapped case xxiii.), ascites from cancer of the peritoneum (tapped cases i., iv., xiv., and xxvii.), abdominal tumors in men (operative case xxvi., and tapped case ii.), in a cyst of the broad ligament (case xi.), in hydrocele fluid (tapped case xiii.), and in fluid drawn from the thoracic cavity (tapped case ix.), in a congenital cyst of the neck (tapped case xxi.), and in a renal cyst (tapped case xxxii.).

Cholesterin is frequently found in other old collections. I have found it in a case of a tumor of the abdominal wall in a man (tapped case ii.), and in an old congestive abscess of the femur (tapped case xxxiii.).

Waldeyer[3] and Spiegelberg[4] say that amœboid bodies are never found in ovarian fluid, and always in ascites. We have above mentioned a case of ovarian fluid (x.) in which all sorts of amœbæ were found. Thus not even this rule is without exception.

After having thus conscientiously stated what I have found to be the fact: that no element is characteristic for myxoid ovarian fluid in the sense as a single hooklet is characteristic

[1] Erich in Boston Medical and Surgical Journal, vol. ciii., pp. 318–320.
[2] Brooklyn Proceedings, 1878, vol. iii., p. 323.
[3] Archiv für Gynaekologie, vol. i., p. 272.
[4] Volkmann's Vorträge, No. 55.

for a hydatid, I must still say that it is my conviction that in the great majority of cases we can decide if a supposed tumor is ovarian or not. We have found exceptions from all rules; but, on the other hand, it is extremely unlikely that a case should present a mere combination of exceptions. By examining *all* the characters discussed in the preceding pages, by combining the physical, chemical, and microscopical properties, and weighing one against the other, and, most of all, by *taking the signs found in the fluid together with the other features of the case*, we can almost always come to a correct result. It would be unwise to rely on the characters of the fluid alone. We do not act thus with the other signs. We do not restrict ourselves to palpation, or percussion, or auscultation, or the use of the uterine probe, or to the history of the case. We take all points together, and the same ought to be done with the characters of the fluid. Nobody ought to open an abdomen only because a microscopist, be he ever so expert, declares a fluid to be ovarian; but when other things point in this direction, very valuable information may be obtained from a careful examination by an experienced observer.

When I said just now that we almost always can come to a correct result, I mean to say that cases like those of Byrne, Erich, and H. K. Bennett probably can be avoided. *As to cysts of the broad ligament, I do not know of any character by which they can be distinguished from ovarian.*

History.—In 1846, John Hughes Bennett[1] described a case of ovarian tumor: "The fluid contained flocculi composed of numerous cells, varying in size from one one-hundredth to one-fortieth of a millimetre in diameter. The great majority were about one-fiftieth of a millimetre. They were slightly granular, of round and oval shape, unaffected by water, but becoming more transparent on the addition of acetic acid, and exhibiting a distinct nucleus about one one-hundred and fortieth of a millimetre in diameter. The nucleated cells were imbedded in a granular matter which could easily be broken down." This description applies exclusively to the *large* bodies we find in ovarian fluid. He did not notice any of the nuclei which are so important a part of this fluid, and the statements, that the bodies were *slightly* granular, that they contained a nucleus,

[1] Edinburgh Med. and Surgical Journal, 1846, vol. lxv., p. 279.

and were imbedded in a granular matter, apply only to some of these corpuscles, whilst others exhibit quite different characters, as shown above. But imperfect as the description is, it is clear enough to enable us to recognize the bodies the author describes, and, as he is the first who has done this, I have in this paper throughout called these large bodies *Bennett's bodies.*[1]

In his clinical lectures on the "Principles and Practice of Medicine" (second edition, New York, 1858, p. 91, Fig. 70),[2] Bennett draws both large granular cells with or without a nucleus, and *small bodies invariably without a nucleus*, which latter are *entirely like Drysdale's corpuscles.* Fig. 172 on page 172 shows very distinctly Drysdale's corpuscles, *after addition of acetic acid*, without nucleus. The text describes them as "pale, round and oval corpuscles, the outline of which becomes stronger on the addition of acetic acid." Thus there is no doubt that Bennett has known these bodies, but he does not claim that they are characteristic for ovarian cysts.[3]

[1] I do not think Gluge ought to have the place accorded to him by several authors. It is true that as early as 1839 he described and delineated some bodies which he called *compound inflammation-corpuscles*, and that in his Atlas of Pathological Histology (translated by Joseph Leidy: Philadelphia, 1853, p. 67) he says that in a case of ovarian cysts the fluid contained these corpuscles. But when we examine what he means by his compound inflammation-globules (Anatomisch-mikroskopische Untersuchungen zur Pathologie. Minden u. Leipzig, 1839, plate i., fig. i., 2, text p. 12), we find that it is something utterly different from the bodies found in ovarian cysts, and first described by Bennett. Gluge's compound inflammation-globules are, during the stasis caused by inflammation, observed in the capillaries, and are red blood-corpuscles which lose their membrane and their color. The nuclei [*sic*] only remain, and are bound together with a whitish cement, so as to form dense, opaque round heaps of globules. By pressure, or by acetic acid, these heaps are disintegrated and the small globules separated. During a later stage, the capillaries burst, and the compound inflammation-globules are found in the parenchyma of the tissue. Nowadays we do not admit the presence of any nucleus in the red blood-corpuscles of man, but whatever Gluge's globules may be, they are not what we have seen Bennett's corpuscles to be, viz., changed epithelial cells.

[2] The first edition was published in London in 1852. Through the courtesy of Mr. Geo. Bullen of the British Museum, I am informed that Fig. 70 of the second edition is found as Fig. 89, on page 218 of the first edition, and Fig. 172 of the second edition as Fig. 92, on page 219 of the first edition. Thus it is proved that Bennett has known these bodies before Beale's first edition was published (1854).

[3] Atlee thought it necessary to defend his and Dr. Drysdale's priority

In 1857, Lebert[1] made the important statement that he "had always been able to trace all intermediate degrees between the epithelial cells which he found in the fluid changed or infiltrated with fat-granules or constituted by simple nuclei, and those epithelial cells which, on the internal surface of the cysts, form a beautiful lining, the cells of which by juxtaposition get a polygonal aspect." Plate xxxv., Fig. 8, gives a poor representation of what he calls *granular bodies* of ovarian cysts. They are neither like Bennett's nor Drysdale's corpuscles.

Lionel S. Beale described only the two kinds of bodies which Bennett had already delineated and described, and his drawings are small and indistinct,[2] but his description was somewhat more precise. He describes: "1. Small, delicate, transparent, and faintly granular bioplasts, without the slighest appearance of a nucleus, some being somewhat larger, and others smaller than a pus-corpuscle. 2. Large bodies, often as much as one one-thousandth inch [$=25\ \mu$] in diameter, but varying in size, of a dark color by transmitted, and white by reflected light. These, which have been termed "granular corpuscles, compound granular cells, inflammation-globules, etc., are aggregations of oil globules in a cell-form." It is strange that he calls the small bodies *faintly* granular, for the granules are shining and well marked in those of the nuclei which correspond with Drysdale's corpuscles. Nor does he state that these granules, as well as those in the large cells, are oil globules, only of smaller dimensions and always separated from one another. His expression, that the large bodies are agglomerations of oil globules in cell-*form*, does not contain any information about their origin.

By far the most thorough description of ovarian fluid existing is that published in 1864 by *Eichwald*, and to a great extent reproduced in Spencer Wells' classical work. He gives

against Dr. Waldo J. Burnett, who claimed to have found the ovarian cell before them, and described it in his paper on "The Cell" in the Transactions of the American Medical Association in 1853. By referring to Dr. Burnett's paper, I find that he has no claim whatever to priority in this question, and that most of what he says on ovarian cysts is wrong.

[1] Traité d'Anatomie Pathologique, vol. i., p. 245, Paris, 1875.

[2] Beale: The Microscope in Medicine, fourth edition, Philadelphia, p. 270, and Plates xxx., Fig. 6, and xxxvii., Fig. 7. The same is already found with immaterial differences in the first London edition, 1854.

much better drawings, and for the first time a rather complete list of all the morphological elements. He was the first who described the transformation of epithelial cells to Bennett's corpuscles, which he calls granule-heaps (Körnerhaufen). He gave also an excellent description of bodies which, he says, were entirely like Lebert's pyoid bodies. "They had a dark contour, and a clear centre which contained a different number of extremely fine black dots, but sometimes also a few larger, highly refracting granules." The former are what I have described as finely granular bodies, and the latter are Drysdale's corpuscles. Both are, as I have pointed out, nuclei of epithelial cells. He is also the first who speaks of colloid globules, horn-cells, cholesterin, and pigment. But after giving Eichwald full credit for his entirely original work, we cannot withhold some criticisms. Thus, he states, p. 385, that the small secondary cysts were lined with *flat* epithelium. This is a mistake. It is always columnar or, perhaps, rather goblet-shaped, as is easily ascertained as often as the cells are seen in side view. Secondly, he mixed water with the fluid, which probably explains the many queer things he has seen, especially in regard to colloid globules, and which are reproduced on pp. 97 to 100 of Spencer Wells' work. Finally, Eichwald has still by far too many categories, which render his description obscure.

Nunn does not merit the distinct place in the history of ovarian fluid sometimes allotted to him in text-books. He mentions only the "large cells gorged with granules,"[1] which others had described before, and not the small body with shining granules; but the term *gorged* is a good one, and might be retained by those who object to the use of the discoverer's name, to designate natural objects. It points to one difference, among others, between Bennett's and Drysdale's corpuscles, the latter never becoming gorged. But on the other hand, there are many Bennett's corpuscles in which the fat-globules are pretty far apart.

In 1870, Waldeyer wrote his excellent article on Epithelial Tumors of the Ovaries.[2] He does not mention the nuclei with the shining granules which had been well described by several

[1] Baker Brown, l. c., p. 47.
[2] Archiv für Gynäkologie, i.

of his predecessors, but, on the other hand, he is the first who not only pointed out the presence of well-preserved columnar epithelial cells, but added that this was the most noteworthy element, a sentiment in which I entirely agree with him.

A historical sketch, be it ever so brief, would be unjust if it did not mention Spiegelberg. Although he has not discovered any of the elements of ovarian fluid, he has been one of the first to point out the diagnostic value of the examination of the fluid, and has repeatedly come back to the subject[1] with increased experience and unshaken confidence, but he has only had the distinction of ovarian fluid from ascites in view, and his assertions, as we have demonstrated above, are a little too positive.

Having spoken in such detail of the commonest kind of ovarian cysts, we can be brief in treating of the rarer varieties.

3. *Dermoid Ovarian Cysts.*

We find three dermoid cysts on our list (operative cases ii., xix., xxii.). None of them were of the pure classical type, consisting of a monocyst filled with fat. They were all combined with myxoid cysts. In case ii. was found one compartment filled with a thick yellow fluid, like pea-soup, that could scarcely pass through Emmet's canula, which has a calibre of about five or six millimetres, smelt very offensive, and soon formed a solid tallow-like mass. Besides, this cyst contained a mass of long, rolled-up hair. But from other compartments came a much thinner fluid, which, although it was rich in coarse and fine fat globules, contained columnar epithelial cells (Fig. 34 *bis*) and nuclei with shining granules.

In case xix., both ovaries formed polycysts, the greater part of which had the character of myxoid cystomas, but others had skin-like walls, and contained hairs. From some came a fluid, which in no respect differed from that found in most myxoid cystomas, except that the coagulum formed by boiling remained unchanged by boiling with an excess of acetic acid. It contained small, finely granular nuclei (Fig. 20), a few nuclei with shining granules (Fig. 19), groups of columnar epithelial cells with nucleus, others with shining globules

[1] In Monatschrift für Geburtskunde, vol. xiv., 1859, and vol. xxxiv., 1869; Archiv für Gynäkologie, vol. i., 1870, vol. iii., 1872, vol. vi., 1874; Volkmann's klinische Vorträge, No. 55, 1875.

(Fig. 3, *b*), a few red blood-corpuscles, cells with the type of colorless blood-corpuscles (Fig. 23), and cholesterin. Finally, some compartments contained, mixed with this fluid, large masses of liquid fat swimming in a watery fluid.

Case xxii. was a multilocular cyst, containing cartilage, bone, and teeth. Three large compartments were emptied

FIG. 34 *bis.*—Epithelial cells in fatty degeneration, from myxo-dermoid ovarian cyst.

during the operation, and contained all the same kind of fluid. Then there was a large solid mass containing small cysts. The fluid had a peculiar appearance, being full of small shining scales, which formed clouds in a more translucent fluid. As in the preceding case, the fluid coagulated almost entirely by boiling, and the coagulum was not affected by boiling acetic acid. The microscope showed that the field was crowded with

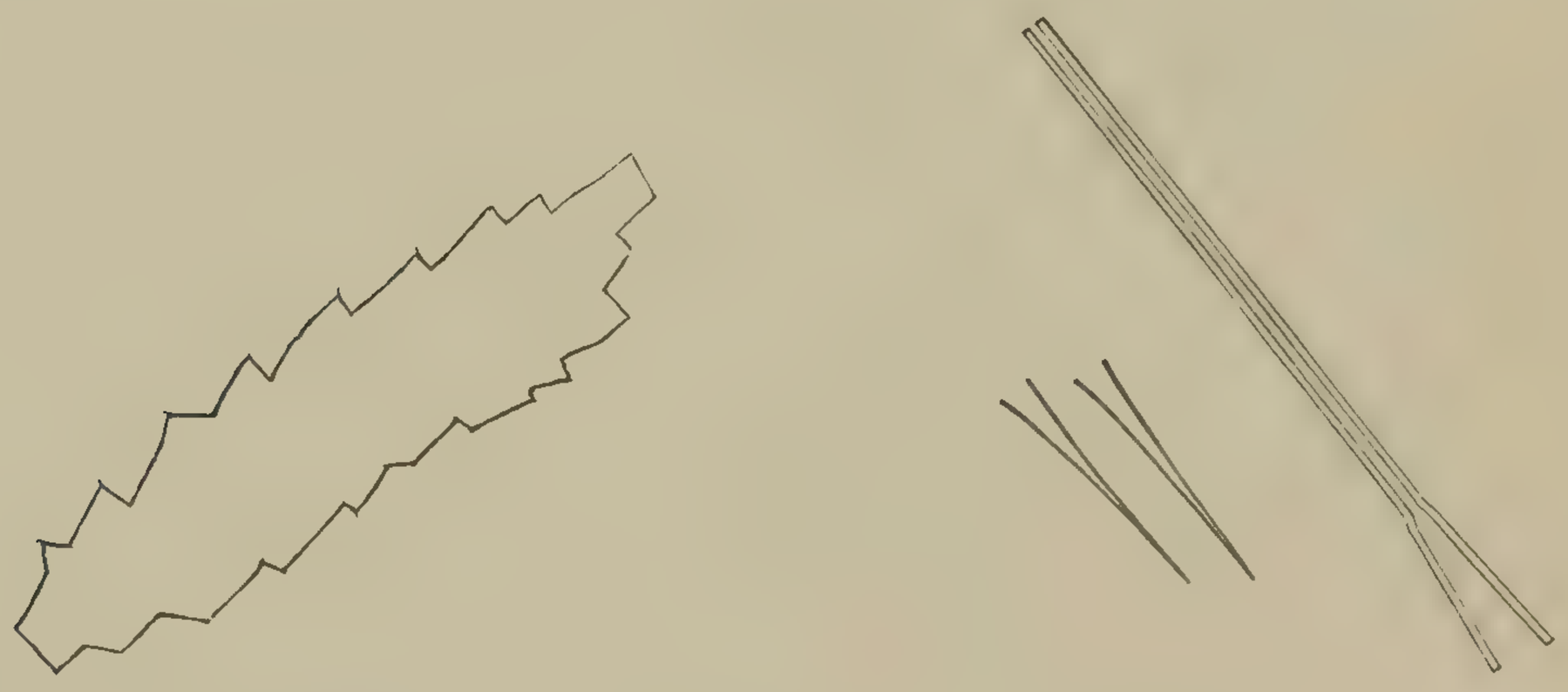

FIG. 35. FIG. 36. FIG. 37.

Rare forms of cholesterin (?).

cholesterin, which formed the fine shining scales seen with the naked eye swimming in the fluid. Besides the common forms (Fig. 27) were seen pieces with teeth, like the blade of a saw (Fig. 35), or needles (Fig. 36), or tubes (Fig. 37), composed of a long part with parallel walls and a short coniform part. All these were composed of the same colorless transparent mate-

rial. If these two latter forms are not cholesterin, I suppose they are some other kinds of fat crystals. Furthermore were found large columnar epithelial cells, some fresh, others in more or less fatty degeneration (Fig. 39); some Bennett's corpuscles, exceedingly few nuclei with shining granules, and epidermal scales. The latter are easily distinguished from the epithelial cells by being flat and without any nucleus.

FIG. 38.

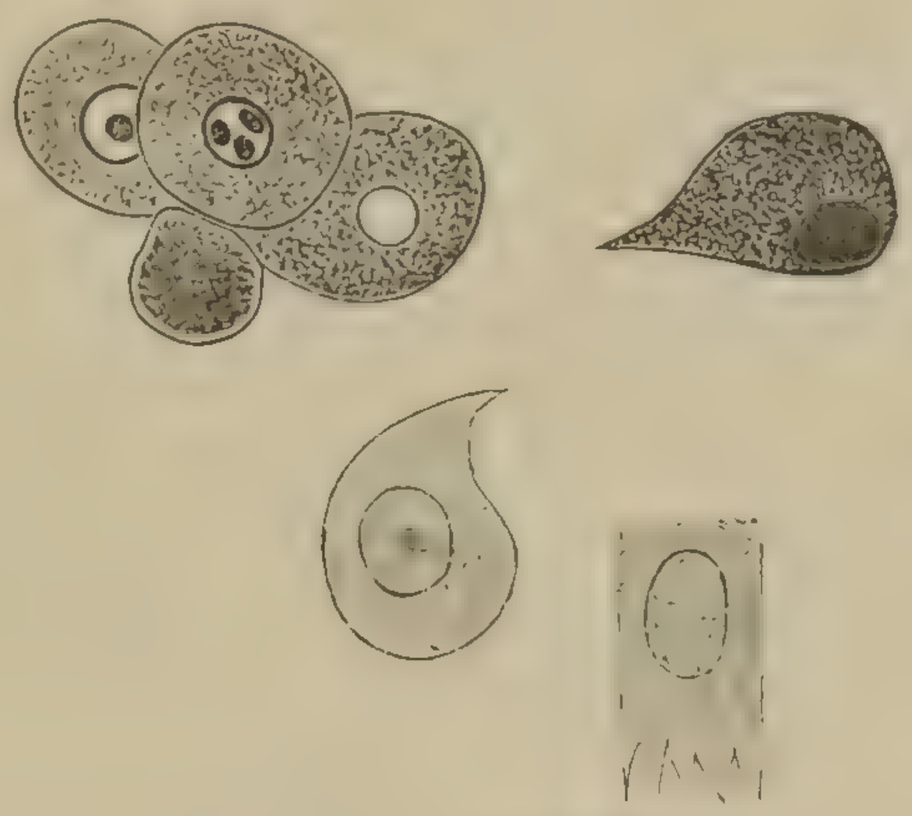

FIG. 39.

FIG. 38.—Epidermal Scales from Myxo-dermoid Ovarian Cyst.
FIG. 39.—Columnar Epithelial Cells from Same, two of them filled with Yellow Fat.

If now we ask what information, as to diagnosis, would be gained by examining the fluid, it appears that much is left to chance. If a single hair was found, or, if the fluid consisted of melted fat, or contained epidermal scales, it would be sure that it came from a dermoid cyst, but we could not tell that this was situated in the ovary. On the other hand, a fluid like that comprised in a great part of cases ii. and xix., and showing columnar epithelial cells would prove that the tumor was ovarian, but not that it was dermoid.

A fluid like that of case xxii., which contained at the same time columnar epithelial cells and epidermal scales or hair, is the only one which enables to make the complete diagnosis of dermoid cyst of the ovary.

4. *Multilocular Ovarian Cyst with Watery Fluid and Ciliated Epithelium.*

Case li. is so peculiar that I must make a class apart of it. The fluid was first sent to me by Dr. Bozeman for diagnostic purposes. It was almost colorless, slightly opalescent,

not viscid, reaction alkaline, specific gravity 1013. No spontaneous coagulation. On boiling, very slight coagulation, a little more after adding a drop of acetic acid, still more with nitric acid. The fluid, which had become turbid by boiling with a drop of acetic acid, became clearer by boiling with an excess of the same reagent. The microscope revealed great scarcity of elements. It contained many isolated small oil-globules, some large globular bodies, composed of the same (Fig. 40), some empty epithelial cells (so-called horn-cells), and a few very pale, small, columnar epithelial cells seen in front view, not a single one in side view, no nuclei with fatty granules (Drysdale's corpuscles). It was, of course, believed by others to be from a cyst in the broad ligament. I made the diagnosis "either cyst of broad ligament or true ovarian monocyst." The operation showed that it was indeed ovarian,

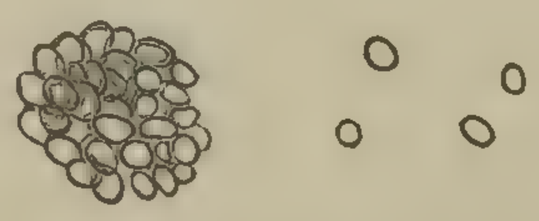

FIG. 40.—Isolated and Conglomerated Oil-globules from clear Ovarian Fluid.

and what surgically is called a monocyst; that is to say, there was one large cyst containing from ten to twelve ounces of fluid, but another cyst in the wall of the main cyst contained half an ounce of the same clear fluid. Besides, there were found in the wall several other cysts of the size of a small walnut. I opened two of these; one contained the same kind of clear thin watery fluid as the main cyst. The other contained a thick cherry-colored bloody fluid, which, under the microscope, showed red blood-corpuscles and a great number of large and small epithelial cells in fatty degeneration; or perhaps some of them were only nuclei.

At the bottom of the main cyst was found a finger-thick solid mass, a development of the ovary. The pedicle was formed by the ovarian ligament, the Fallopian tube, and a part of the broad ligament. It was the right ovary. On the cyst were seen the collapsed compartments which had been tapped some weeks before. Scrapings from the outer surface of the cyst showed large pieces of small polygonal epithelium, which, in side view, was seen to be columnar. This charac-

teristic epithelium was also seen on pieces snipped off with the scissors, and treated with a solution of nitrate of silver. The wall was 4 mm. thick, and composed of the two common layers of fibrous tissue bound together by loose connective tissue. They were very white and so like one another that they could not be distinguished with the naked eye.

Thus it is absolutely certain, both from macroscopical and microscopical examination, that this was a cyst situated in the ovary. Nevertheless, the fluid was watery and limpid, and did not contain nuclei with shining globules.

The interior of the main cyst was studded with small protuberances, some of which were a centimetre long. The whole inside of the main cyst, inclusive of the protuberances, was covered with ciliated columnar epithelium. This was too transparent to be seen on the underlying connective tissue, but large pieces were shoved out, and showed the cilia in the most lively movement, both on surfaces seen in front view and on long rows seen in side-view.

This, then, is a very striking illustration of the fact pointed out by Fischel (l. c.) that parovarian elements may develop and form cysts in the interior of the ovary.

As for clear watery fluid with few histological elements, we see that it may be found in the ovary, not only in true ovarian monocysts (hydrops folliculi), but also in multilocular, or at least paucilocular cysts lined with ciliated epithelium.

I have only found one other case (vi.) with ciliated epithelium, and there it was not uniform as here, but mixed with non-ciliated columnar cells. As it was one of my earliest cases. examined at a time when it was my intention to pay attention to the microscopical properties only of cysts, I have unfortunately no notes about the physical appearance and chemical properties of the fluid in that case, but it has probably been thicker, for my notes say that it contained very many of Bennett's corpuscles, both with clear oil-globules and with dark granules.

The fact that here was found a fluid as clear as spring water, in a young cyst not larger than a small walnut, shows that the old doctrine of Virchow,[1] recently reproduced by

[1] Verhandlungen der geburtshülflichen Gesellschaft in Berlin. Vol. iii., p. 218.

Spiegelberg,[1] according to which the cysts with serous fluid are old ones, which formerly had colloid contents, is not applicable to all cases.

5. *Cystosarcoma of the Ovaries.*

I have four cases (ix., xli., xlviii., and xlix.) which, on account of the structure of the wall, I have diagnosticated as cystosarcoma. It would take too much space to describe it here, but I may perhaps discuss it another time. In cases ix., xli., and xlix., the fluid was dark red-brown, like muddy Port wine—a color due to a large quantity of red blood-corpuscles and the pigmented variety of Bennett's corpuscles. Besides, there were seen columnar epithelial cells in front and side view, and nuclei with dark and with shining granules, in short, enough to show that it was an ovarian cyst, but *nothing whatever which indicated a malignant character of the growth.*

In case xlviii., no fluid passed through the canula. It consisted in a jelly-like mass, composed of epithelial cells in fatty degeneration and red blood-corpuscles. If a little of this jelly were drawn out with an aspirator it might be recognized, but nothing would enable us to locate the disease in the ovary, the broad ligament, or the tube unless we found epithelial cells which were undoubtedly columnar, but this was not the case with those I found. A similar jelly has been found by Péan in the peritoneal cavity, in what he describes as *gelatinous disease of the peritoneum.*[2] In our case it was not the ovary alone which had undergone such a colloid degeneration. Similar masses were found on the peritoneum. In the ovary, the jelly was contained in compartments with exceedingly thin walls, composed of spindle-cells and lined with columnar epithelium.

This latter case corresponds entirely with what Malassez and De Sinéty[3] describe as "tumeur kystique par tissu colloïde." Even the absence of layers in the walls had struck me. Cruveilhier designated the disease as "areolar or gelatiniform degeneration," and others as colloid cancer. I do not see any reason to call my case cancer, and since it was evidently

[1] Archiv für Gynäkologie, 1879, Vol. xiv., p. 178.
[2] Péan: Tumeurs, etc., p. 418.
[3] Archives de Physiologie, 1880, p. 871.

malignant, and contained many spindle-cells in the thin walls, I have put it together with the sarcomatous cases.

Malassez and De Sinéty describe also a case of true fibro-sarcomatous cyst[1] like my first two cases.

6. *Cysto-Carcinoma of the Ovaries.*

I have on my list three case of ovarian cysts which are cancerous. In case xiii., cancerous tissue was also found outside the ovary. In case xx., in which the diagnosis of cancer had been made clinically by Dr. Thomas, were found some cells in the epithelial lining, which differed from those found in common ovarian cysts by their prodigious size, some of them reaching 94 by 40 μ. Besides this, epithelial cells were interspersed in the cyst-wall. In case xlii. were likewise found large epithelial cells in the wall, and large masses, composed

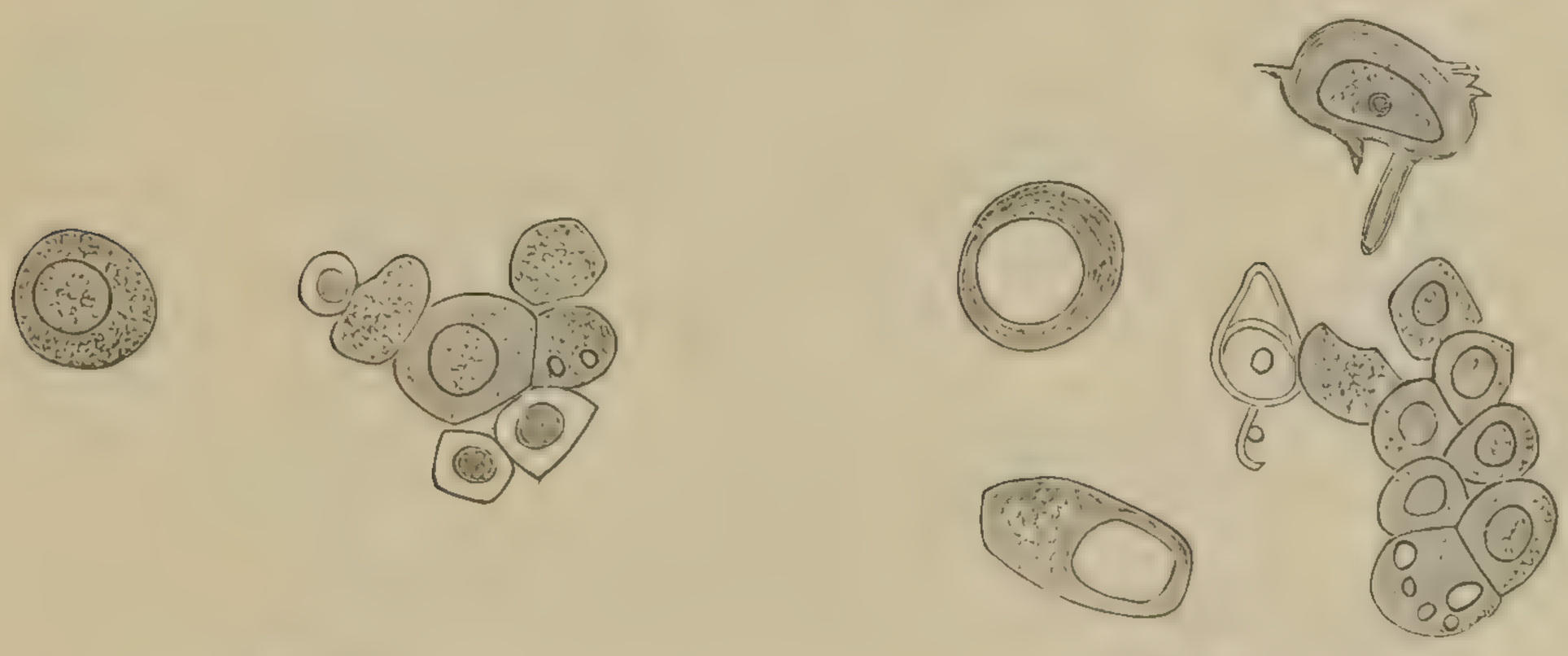

Fig. 41. Fig. 42.

Isolated and Grouped Epithelial Cells from Cancerous Ovarian Cysts.

exclusively of epithelial cells, without any secondary cyst formation. Besides these, case xxix. showed beginning cancer. The tumor was almost solid, and in some places appeared very large epithelial cells in the wall, reaching 43 by 27 μ.

The only particularity which the fluid presented in all these cases was the uncommonly large amount of formed elements. In cases xiii. and xx. were, indeed, found large cells with large nuclei or vacuoles, both isolated and in groups (Figs. 41 and 42). Some attained the size of 32 by 13 μ. Sometimes they were round or angular, sometimes pear-shaped. Sometimes the protoplasma presented a peculiar thready appearance. When I first saw them I laid much stress on them, but with

[1] Ibidem, p. 870.

growing experience I have become more and more sceptic as to the possibility of distinguishing cancer by the fluid contained in the cyst. Thus, in case xv., which was only a *myxo-fibroma* without any sign of malignancy, the fluid contained also rather large epithelial cells, sometimes with a large nucleus or with a vacuole. In case xxiv., which was simply a myxoid glandular proliferous cystoma, without any trace of sarcomatous or cancerous structure of the wall, I found a large pear-shaped body, measuring 81 μ by 40 μ, with dark granules like the dark variety of Bennett's corpuscles; epithelial cells with prolongations and thready appearance of the protoplasm; and numerous groups of small epithelial cells (Fig. 43), most of which

FIG. 43.—Single and Grouped Epithelial Cells from Non-Malignant Ovarian Cyst.

measured only 8 μ, whilst the largest reached 24 μ. In case xxv., in which there was a double papillary proliferous cystoma, but no sarcoma or cancer, were found groups of cells of different sizes with vacuoles. In case xlvii., which was a simple myxoid proliferous cystoma, the fluid was so full of epithelial cells that it looked like pus, although it did not contain a single pus-corpuscle, and on standing it separated into a clear upper layer and a deposit three times more voluminous.

Thus, in my experience, neither the quantity nor the size, nor the shape, nor the arrangement of the elements found in the cystic fluid enables us to tell that it comes from a sarcomatous or carcinomatous cyst, but in all cases it was easy to tell the cystic origin of the fluid by the characters set forth in speaking of myxoid cysts.

With regard to power of resistance to decomposition, I found the epithelial cells perfectly preserved a week after operation in case xlviii. After two weeks they were dissolved to a

grumous mass, and only a few Bennett's corpuscles and nuclei with shining granules, were still present.

Other observers have thought to find characters peculiar for fluid from malignant cysts. Thus Spiegelberg,[1] in 1859, described some peculiar elements in a case of cancer. In 1875 and 1876, Thornton wrote at some length on the subject,[2] and Spencer Wells states in his lectures[3] that, if the large groups of cells described by Thornton are seen in a fluid, one may be pretty certain the tumor is malignant of some kind. I have not found his groups composed of large pear-shaped, round or oval, granular cells with several large, clear nuclei, nucleoli, and vacuoles in any of my cases of sarcomatous, carcinomatous, or papillomatous cysts. We shall come back to the subject when treating of ascites.

7. *Cysts of the Broad Ligament.*

The cysts of the broad ligament are of late often designated as parovarian cysts, but I think, from personal experience, Waldeyer is right when he points out that they are as often found far away from the parovarium as in the locality belonging to that organ.[4] I have seen small cysts in the most different parts of the broad ligament. The most common place is the hydatid of Morgagni and the fimbriæ of the tube, but they may be found anywhere, while the parovarium has quite a definite place, between the outer part of the tube and the hilus of the ovary. Waldeyer thinks that in any place parts of his so-called germinal epithelium (*Keimepithel*), which covers the Wolffian body and gives rise to the Fallopian tube, may be surrounded by connective tissue and form the germ of cysts of the broad ligament. The parovarium is the remnant of the sexual part of Wolff's body. Inside of this organ Waldeyer has found,[5] even in the full-grown woman, often extending quite up to the uterus, narrow canals filled with epithelial cells and granular cellular detritus. These canals are remnants of that other part of the Wolffian body which constitutes the primordial kidney. These too may doubtless become cystic, and be the seat of cysts of the broad ligament. I retain, therefore, this old name.

[1] Monatsschrift für Geburtskunde, 1859, vol. xiv., p. 205.
[2] Medical Times and Gazette, April 10th, 1875, and May 13th, 1876.
[3] Medical Times and Gazette, 1878, vol. i., p. 669.
[4] Waldeyer: Eierstock und Ei, Leipzig, 1870, p. 128. [5] *Ibid.*, p. 142.

In no part of our subject do the text-books contain more errors than in regard to these cysts. Thus, in our most comprehensive American work on the diseases of the ovary, we read that cysts of the broad ligament are *always monocystic*, that *no albumen* is found in the fluid, and that its *specific gravity is* 1005.[1]

First of all, we must arrive at a clear understanding about the definition of a cyst of the broad ligament, and, as here we inquire about the fluid, it would be to beg the question to argue from its characters. The diagnosis must be based exclusively on the relations and structure of the sac. Not every cyst found in the broad ligament is a cyst of the broad ligament, in our sense of the word. It is a well-known fact that ovarian cysts, instead of growing into the peritoneal cavity, may be developed between the layers of the broad ligament. In case xlv., when the abdominal cavity was opened, the right tube was seen stretched like a thin, hard string near up to the umbilicus, and the broad ligament was drawn up in front of the lower half of the tumor. It is not very rare to see the lower part of the tumor developed between the layers of the broad ligament, but I do not know if Thornton is correct when he states[2] that the ovarian and extraovarian unilocular cysts often occupy the same position, and may each have an ovary but little altered attached to them by some loose connective tissue and blood-vessels. Then I think it would be impossible to distinguish them, and I believe, therefore, that he has regarded as being unilocular ovarian cysts developed in the broad ligament what really were extraovarian cysts. When we find a tumor in the broad ligament and the ovary bound to it with, or, as I would say, separated from it by connective tissue and vessels, I do not see how we can escape the conclusion that it is an extraovarian cyst. There are only two ways in which we can tell a cyst of the broad ligament from an ovarian cyst; one is the fact that we find the ovary beside the tumor, and the other is, as I stated above, the character of the outer epithelium. A tumor covered with columnar epithelium is ovarian, and cannot be anything else, while the cyst of the broad ligament, being covered with peritoneum, has flat peritoneal endothelium. In cases of intraligamentous dovelopment

[1] Peaslee, l. c., p. 153.

[2] Thornton, in Med. Times and Gazette, April 10th, 1875, p. 386.

of an ovarian cyst, the lower portion is covered by peritoneum, but the upper part has the columnar epithelium characteristic for the ovary. Other anatomical signs are, indeed, of some value, but do not decide the question as to the nature of a tumor. Thus, as a rule, ovarian cysts have a mesosalpinx, while cysts of the broad ligament extend right up to the tube, which becomes imbedded in the wall. But we have seen above that these characters were present in a case of true ovarian monocyst (see p. 9). Commonly cysts of the broad ligament are unilocular, but they have been found with several compartments. Thus, Atlee found a small secondary cyst in the wall,[1] Spiegelberg[2] likewise. Lawson Tait[3] describes a case in which the tumor was composed of five or six cysts. Thornton[4] says that some specimens he examined, and one of which he showed to the Pathological Society, proved that we may have multiple and multilocular cysts of the broad ligament. Kiwisch[5] also found several unilocular cysts, one beside the other. In a patient operated by Dr. Thomas for a multilocular ovarian cyst was found, on the other side, situated between the healthy ovary and the Fallopian tube, a parovarian tumor, composed of two compartments, each of the size of an English walnut, besides divers minute cysts in the neighborhood.

In the London *Lancet*, July, 1876, p. 114, is found an article on some laparotomies of Péan's. They are stated to be from notes translated by Wm. C. Rowlatt. The list comprises all laparotomies performed by Péan from the 20th of February, 1868, to the 31st of December, 1875, excepting those done with the object of removing tumors from the ovaries and the uterus. There are thirty-four operations, and among them no less than ten tumors are said to have been multilocular, besides those who were "areolar." This information is entirely misleading. By referring to the complete list[6] of Péan's two hundred and ninety-nine laparotomies, performed between November 1st, 1864, and December 31st, 1877, I find confirmed by himself what I surmised, namely, that he calls any tumor extending into the broad ligament, a cyst of the broad ligament. There

[1] Schatz: Archiv für Gynækologie, 1876, ix., p. 142.
[2] *Ibid.*, 1870, i., p. 485.
[3] Tait, l. c., p. 222.
[4] Med. Times and Gazette, April 10th, 1875.
[5] Schatz, l. c.
[6] Péan: Clinique chirurgicale, Vols. i., ii. Paris, 1876–1879.

may be said much in favor of this terminology, but the fact is, that all other writers I know of hitherto have used the term cyst of the broad ligament in a quite different sense, designating thereby a parovarian, or at least extraovarian cyst. It is evident, even from the short description accompanying each case in Péan's own list, that his cases were almost all what others more accurately have termed intraligamentous ovarian cysts.

The wall of cysts of the broad ligament is commonly thin, and formed of a single layer of dense connective tissue, bound with loose connective tissue to the peritoneal covering, and lined with a single layer of small, short, columnar, polygonal epithelial cells. It has very few blood-vessels, and is, consequently, of a whitish color. The inside is perfectly smooth, without villi or pouches. But all these characters were found in the above-mentioned case of true ovarian monocyst, the outer wall being so thin that it might have been taken for the thickened peritoneum. On the other hand, Spiegelberg[1] has given a careful description of a cyst of the broad ligament with quite different anatomical characters. It was two to four millimetres thick, and was composed of: first, a ciliated columnar epithelium, sending pouches down into the wall; second, a layer of connective tissue with many nuclei, a network of connective tissue with fine meshes, large blood-vessels with a thick muscular coat, bundles of muscular fibres, which especially accompanied the arteries; and third, a particular muscular layer. Besides, the fluid was like that of myxoid ovarian cysts. This description differs so entirely from all what is else known of cysts of the broad ligament that I cannot refrain from giving a slight doubt room in my mind, in spite of the testimony of such a good observer. He does not mention the distance between the tumor and the ovary. Is it quite sure that it was not an intraligamentous development of an ovarian cyst? Having myself found large masses of smooth muscular fibres in the wall of an ovarian cyst (case ix.), the presence of this element would not have the same weight with me as it evidently has had with Spiegelberg. But it is always a dangerous thing to think you know better than the man who operated the case, and described it most minutely. I have, therefore, also given an abstract of his observation in this connection.

[1] Spiegelberg: Archiv für Gynäkologie, 1870, Vol. i., p. 483.

Cysts of the broad ligament are much rarer than ovarian cysts. On my list of operative cases, I have only got three (cases v., xi., and xii.). Case xii. is the only one on the list in which I have not seen the sac. The fluid was sent to me by Dr. Thomas. I made the diagnosis, and when I communicated it to the operator, he said that he had arrived at the same conclusion from the relations of the sac, as revealed during the operation. In the two others, the sac had the following characters: it was monolocular, from one to two millimetres thick, covered with peritoneum, which was bound by very loose connective tissue to the wall proper. This was composed of dense connective tissue without smooth muscle-fibres, but, in case xi., with cells in a myxomatous arrangement. The inside was covered with a layer of non-ciliated, short columnar, small-celled, polygonal epithelium without any trace of villosities or pouches (Fig. 47).

Gusserow,[1] in a special paper on these cysts, says that the number of cases in which autopsy or ovariotomy rendered an anatomical examination possible is quite small. He enumerates only seven: one of Wagner (*Berliner klinische Wochenschrift*, 1868, p. 410), one of G. Müller (*Scanzoni's Beiträge*, v., p. 163), one of Spencer Wells (Diseases of the Ovaries, second edition, p. 31), one of Atlee (Ovarian Tumors, p. 103), one of Bantock (*Obstet. Journ. of Great Britain*, May, 1874, p. 124), and two of Koeberlé (*Gaz. méd. de Strasbourg*, 1873, p. 187). In all, the sac was covered with peritoneum. The inside was smooth; in Müller's case, it was covered with long cilia; in Koeberlé's, there was a single layer of columnar epithelium which here and there was ciliated; in Spencer Wells' case, the inside was covered with a flattened [?] polygonal epithelium. In the other cases, no mention is made of the histological character of the inner surface.

The fluid in all my three cases had much in common. It was colorless, light-yellow, greenish or opalescent, limpid or slightly turbid, not at all viscid or scarcely so. Its specific gravity was 1010 in the two cases in which it was taken. Its reaction was slightly alkaline or neutral. It did not coagulate spontaneously, nor did it coagulate by boiling or very slightly so before addition of an acid. I had not begun to test for paralbumen when these cases occurred. The microscopical exam-

[1] Gusserow in Archiv für Gynäkologie, 1876, vol. ix., p. 480 *seq.*

ination showed also much similarity between these three cases. There were remarkably few elements, very few red blood-corpuscles, small epithelial cells (Fig. 44), granules, no cholesterin. Bennett's large corpuscles were found in cases xi. and xii., in the former with dark granules and in comparatively great number (Figs. 45 and 46). Nuclei with shining granules (i. e., Drysdale's corpuscles) were found in cases v. and xi. (Fig. 19).

This fluid is different from that found in most myxoid cystomas, but on the other hand, it has the most striking likeness with that found in the true ovarian monocyst: same color, same appearance, same specific gravity, same properties in regard to coagulation. The only difference was, that in the ovarian monocyst no cells were present, but this is probably merely accidental. Since the epithelial lining in both kinds of cysts was found to be exactly alike, nothing is more probable

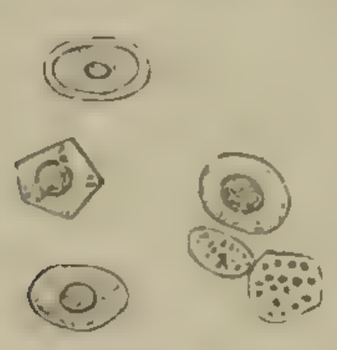

FIG. 44.

FIG. 45.

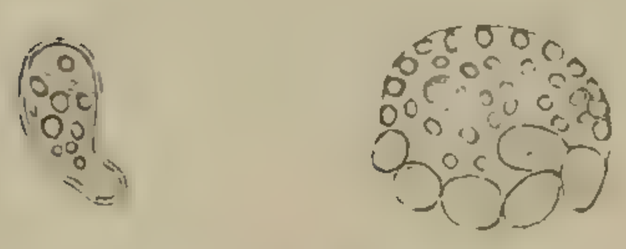

FIG. 46.

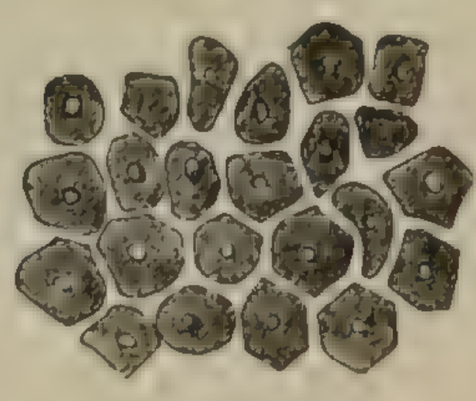

FIG. 47.

FIG. 44.—Small Epithelial Cells in Fluid of Cyst of Broad Ligament.
FIGS. 45 and 46.—Degenerated Epithelial Cells in Fluid of Cyst of Broad Ligament.
FIG. 47.—Inner Epithelium of Cyst of Broad Ligament.

than that in another case of true ovarian monocyst we might find small epithelial cells or their transformation into Bennett's corpuscles, or their nuclei in fatty degeneration. The smallness of the epithelial cells is not distinctive. I found similar small cells in tapped cases iv. (cancer peritonæi) and xi., which turned out to be an ovarian myxoid cystoma (operative case xxiii.). I hold, therefore, that it *is impossible to tell by the fluid alone if a tumor is ovarian or a cyst of the broad ligament.*

This view is corroborated by the experience of others. Waldeyer[1] has examined one in which he found that the deposit showed "the same characters as ovarian cysts." It is true it

[1] Waldeyer in Archiv für Gynäkologie, 1870, vol. i., p. 272.

did not contain any paralbumen, but this substance was found in large quantity in another case he examined. Lawson Tait[1] states that, in the majority of his cases of parovarian dropsy, the fluid has been thick even to viscidity. In one the specific gravity was 1024.6. In such parovarian fluids he has seen all the microscopic appearances, said by some writers to be characteristic of ovarian tumors. Duncan[2] says that he has seen it like honey in consistence, and like coffee-grounds in appearance. I wonder if these authors had excluded the possibility of intraligamentous development of ovarian cysts. In Spiegelberg's above-mentioned case, the fluid had also all the characters of ovarian fluid (paralbumen, no spontaneous coagulation, granular detritus, large cells with fatty granules, and cholesterin).

Westphalen[3] states that similar cases were found by Scanzoni and Kiwisch, while, on the other hand, absence of albumen was found in three ovarian cysts by Naunyn.

In Müller's above-mentioned case was found much albumen, in Atlee's and Koeberlé's none, in Bantock's very little. In the other of the cases collected by Gusserow, the composition is not stated. The specific gravity was low in all cases; in Bantock's even 1003. It was clear like water, or slightly greenish, yellowish, or opalescent (Wagner, Atlee, Bantock).

It appears from the above that both ovarian cysts and cysts of the broad ligament may have serous or colloid contents, but the latter is common in ovarian cysts, rare in extraovarian cysts, while the watery fluid is common in extraovarian, rare in ovarian cysts, but may still be found, not only in true monocysts (p. 9), but in multilocular cystomas (p. 43).

We come now to rarer kinds of cysts in regard to which my material has necessarily been scant, but on the other hand it will be found rich in rare cases, and besides I think it may be of practical value to have united in one place a synopsis of what is found scattered through books or periodicals in different literatures.

We will first mention

8. *Uterine Fibrocysts.*

This is a rather rare disease. While thousands of ovarian

[1] Tait in the Lancet, Feb. 7th, 1880.
[2] M. Duncan: Clinical Lectures on Diseases of Women, p. 191.
[3] L. c., pp. 94, 95.

cysts have been described, nay more than a thousand operated on by a single man, Heer,[1] in a monograph on the subject, has only been able to collect seventy cases, and may be the diagnosis is not beyond a doubt in some of them. Thus, in the material used for the present treatise, the diagnosis was twice made by others, but a minute examination of all the features of the operations, the macroscopical relations, and microscopical structure, convinced me that the tumors were ovarian, and they have been mentioned above in the chapter on cystosarcoma of the ovary. Clinically, the diagnosis is still oftener made in cases of ovarian cysts intimately connected with the uterus.[2]

Dr. Emmet[3] says in his dry, honest way, "I have, in former years, seen an unusual number of fibro-cystic tumors of the uterus, from my being so long in charge of the Woman's Hospital, where these cases were often sent when the physician met with difficulty in forming a diagnosis. But *now, from a more wide-spread knowledge of these growths, I see comparatively few cases.*" Perhaps the late, lamented Dr. Peaslee,[4] if he should give a new edition of his work, would also modify his former statement that he had met with ten cases in two years, and seen not less than fifty since his first ovariotomy in 1850. W. L. Atlee mentions only four cases in his work on Diagnosis of Ovarian Tumors. Spencer Wells, in a paper published in 1878, states that he had removed uterine tumors in twenty-four cases through an incised opening in the abdominal wall. Of these, twenty were solid and four only fibro-cystic. In the same year he reported a fifth case.[5] Together with Keith's first one hundred operations of ovariotomy, only one case of uterine fibro-cyst occurred.[6] Péan,[7] the great specialist in regard to

[1] Heer: Die Fibrocysten des Uterus, p. 19, Zürich, 1874.

[2] See for instance a case of Dr. C. C. Lee, reported to the Obstetrical Society of New York, May 6th, 1879. Am. Journ. Obst., 1879, vol. xii., p. 746. I have examined the pathologist's report of the post-mortem. He calls the tumor a multilocular adeno-cystoma of the right ovary, but since there was "a large amount of solid tissue," and no microscopical examination of the sac is mentioned, I am inclined to think that this was also a cysto-sarcoma, like two of the afore-mentioned cases.

[3] L. c., p. 794.

[4] Peaslee, l. c., p. 106.

[5] Spencer Wells in British Med. Journ , July 27th and Dec. 14th, 1878.

[6] The Lancet, Aug 20th, 1870, p. 250, quoted by Peaslee.

[7] Péan: Clinique Chirurgicale, 1879, vol. ii., p. 832.

uterine fibroids, had up to 1879 only operated seven uterine fibro-cysts, and three cysts which he calls "utéro-cystique," probably subperitoneal cysts; in all ten, against twenty-seven solid uterine fibroids and one sarcoma ("dégénérescence embryoplastique").

Péan[1] divides the cysts of the uterus in two classes, subperitoneal cysts and true uterine cysts. The first are more common, and contain generally a serous fluid, more rarely more or less pure blood, frequently bloody serum. The true or interstitial uterine cysts, that is to say those formed in the depth of the wall, he says, are exceedingly rare. There have scarcely been reported more than three or four cases. M. Demarquay (*Union Médicale*, 1868) has described a remarkable case of this kind. There was one large and several small cysts. Some of the latter contained a ropy fluid, exactly like that in the large cyst, others pure or scarcely changed blood. A microscopical examination revealed that the muscular elements came in immediate contact with the fluid contained in the sac. The fluid was serous. It contained a rather great quantity of red blood-corpuscles which had kept all their normal characters, very few, likewise normal, colorless blood-corpuscles, and besides some large granular cells which were spherical or sometimes irregular, and a little flattened, with very thin walls, and a nucleus in their interior, and almost opaque in consequence of a large quantity of fat-granules. The wall of the cyst was in some places formed by a yellow mass, which proved to be composed of uterine elements, full of fat-granules, and the interstices between the elements filled with the same kind of fat-granules. This excellent description allows us easily to recognize what, in treating of ovarian cysts, we have called *Bennett's corpuscles*.

Péan himself had a case[2] in which a subperitoneal cyst contained a sero-purulent fluid, and several smaller cysts, found in the thickness of the wall, contained, some a bloody, others a serous fluid. In another case, Péan[3] tapped several times, and got every time an entirely different fluid. He does not describe it, but it must not have possessed any striking qualities, for he

[1] Péan: Hystérotomie, Paris, 1873, p. 90.
[2] Ibid., p. 96.
[3] Ibid., p. 137.

adds that the diagnosis was far from complete, and that the fluid might come from a multilocular ovarian cyst. In still another case,[1] eighteen litres of a dark chocolate-colored, little ropy fluid, in which there swam blood-clots, were emptied during the operation.

In Storer's case[2] there were found several cysts, some filled with limpid serum, others with sanguinolent serum, and some perhaps with pure blood. Some of the cysts had entirely smooth walls, like those of common cysts.

In a case of Demarquay,[3] five or six litres of a citrine and somewhat ropy fluid were emptied.

Koeberlé[4] found in the two largest compartments three litres of a serous fluid very rich in *cholesterin*. In numerous smaller cysts, the fluid was limpid, citrine, lymph-like, and *coagulated spontaneously* in contact with the air, the coagulum being almost entirely composed of fibrin. Koeberlé thinks, therefore, that these tumors are due to lymphangiectasis, provoked by the pressure of the neoplasm on the lymphatic vessels. There is no doubt that some of the fibro-cysts have this origin. Similar cases have been minutely described by Fehling and Leopold,[5] and Rein,[6] and it is likely that Atlee's belonged to the same category, for they all contained an amber-colored fluid, which almost instantly coagulated *in toto*, the mass later separating into a fibrinous clot and surrounding serum. But the cysts more frequently contain a non-coagulating fluid.

According to Virchow,[7] the fluid, especially in the small cysts, is almost colorless, or of a yellowish tinge, watery or viscid, most frequently like synovia. Later, and especially in large interstitial tumors, the vessels are much dilated and filled. True extravasations of blood occur, and the fluid shows a red, reddish-brown, yellowish-brown, or dark-brown color. He does not mention its coagulability nor microscopical elements.

[1] Péan: Hystérotomie, p. 154.
[2] Ibid., p. 177 ; after American Journal of Medical Sciences, 1866.
[3] Ibid., p. 179.
[4] Ibid., p. 184.
[5] Fehling and Leopold, in Archiv für Gynäkologie, Vol. vii., 1875, p. 531.
[6] Rein, Ibidem, Vol. ix., 1876, p. 414.
[7] Virchow: Pathologie des Tumeurs. Translated by Aronsohn, Vol. iii., p. 390.

Spencer Wells[1] says that in both cases described in his work on Diseases of the Ovaries, the fluid was a thin serum, with five, ten, or fifteen per cent of blood intimately mixed with it, and not separating until after some hours. In this way, he has satisfied himself, in at least four cases, that tumors which others considered to be ovarian, were really fibro-cystic uterine growths. In his above-mentioned fifth operation, there were nineteen pints of dark fluid, with which, as the cyst became empty, a little blood was mixed. His diagnosis was multilocular ovarian cyst. This was confirmed by Thornton, who reported on the tapped fluid that "the tests and microscope confirm its ovarian character," but unfortunately no details are given. Both ovaries were found healthy.

Most authors mention that the fluid contains so much *albumen* that it coagulates entirely by heat. Routh has found crystals of *uric acid* in it, and *pus*.[2] Trenholme[3] likewise found a large purulent collection. In some cases, the fluid is described as bloody, and is, then, of course, full of blood-corpuscles. According to Virchow (l. c.), the hematin becomes dissolved in older collections, and forms all sorts of derivatives, inclusive of *hematoidin*. Atlee[4] found *fibre-cells* in it which he believed to be pathognomonic, shrunken epithelial cells and oil-globules.

The following are the characters I find attributed to it by perusing the literature up to date. The fluid is colorless, yellow, bloody, or dark-brown; sometimes it coagulates spontaneously and quickly to one solid mass which later separates so as to form a fibrinous clot, surrounded by serum. It always coagulates entirely on boiling. It is watery or more or less viscid; it has neural or alkaline reaction, and rather high specific gravity (1020–1025). It contains constantly a large amount of albumen, often fibrin, and sometimes crystals of uric acid, or hematoidin. The microscope sometimes does not reveal any objects (Atlee's case lxxvii.), but commonly are found red blood-corpuscles, sometimes spindle-shaped cells (Drysdale), epithelial cells in a state of fatty degeneration, or with a shrunken

[1] Wells: Diseases of the Ovaries, p. 201.

[2] Herr, l. c., p. 56.

[3] Trenholme in the Lancet, Nov. 20th, 1874. Schmidt's Jahrbücher, 1877, Vol. 176, p. 30.

[4] Atlee, l. c., pp. 265 and 464.

appearance, fat-globules, pus-corpuscles, crystals of uric acid, hematoidin, and cholesterin.

I have myself met with but one case (liii.). It belonged to the variety described as *myoma lymphangiectodes* by Leopold and Rein. It was in a patient forty-five years of age, on whom Dr. Thomas operated April 9th, 1881. The clinical diagnosis was uncertain. No exploratory puncture had been tried. When the abdomen was opened half a pint of ascitic fluid was evacuated. First, large pieces were cut off from the tumor without any bleeding. Then the enormous tumor was drawn out, and Dr. Thomas' large clamp applied to the uterus proper. The tumor was somewhat dumbbell-shaped, being divided by a horizontal line into a superior and inferior half. On the upper half, toward the right side, were found two knobs, each of the size of a clenched fist. The tumor had many adhesions to the colon.

During the operation, once a clear fluid, about an ounce, spurted out from a cavity in the tumor. The tumor weighed nineteen and a half pounds. After its removal I cut open a cyst in one of the two large knobs mentioned. It contained half an ounce of a clear, citrine *fluid* which soon coagulated, and then separated into a clot and a surrounding fluid. The coagulum was reddish-gray, tough, and microscopical examination showed that it was composed of fibrin with a few red blood-corpuscles and some yellow bodies, which looked like débris of epithelial cells. The fluid was watery, and did not contain any histological elements. The reaction was strongly alkaline, much more so than is the case with ovarian fluid. It coagulated a little by heat, and entirely after addition of a drop of acetic acid. The coagulum thus formed was mostly redissolved by boiling with the same reagent in excess.

The *wall* of the cyst from which this fluid was taken was only between one and two millimetres thick, and easily separable into two layers, the outer of which was thinner, the inner thicker. On the outer surface no endothelium was found, except a few straggling cells which looked like flat epithelial cells in fatty degeneration. The inner surface showed an epithelial (or endothelial) lining. It was composed of flat, roundish cells, each with a rather large round nucleus. The single cells varied

rather much in size, some measuring sixteen by thirty-two μ others only eleven μ.

Both *ovaries* were removed separately. The right was healthy, except so far that at one end it contained a cyst of the size of a small hazel-nut. The left was somewhat enlarged ($6 \times 2.3 \times 1$ centimetres) and showed beginning cystic degeneration. The ovaries had no connection whatever with the tumor.

Between the right ovary and tube were found two small cysts of the size of a pea. One of these parovarian cysts was cut open, and was covered inside with polygonal columnar epithelium *without* cilia.

Where the tumor was cut off above the clamp, the *uterine cavity* was seen, and the uterus here appeared normal. The wall measured here two and three-tenths centimetres. Both tubes started from the cavity. It was found that the tumor had been developed in the posterior wall of the uterus. It formed a large, fleshy mass in which were seen everywhere smaller and larger cavities, the largest containing about an ounce of fluid. The cavities were lying close together, and extended almost to the peritoneum which was thickened. The septum between two cavities was sometimes as thin as tissue paper, but I never found two communicating. In one I found a gelatinous mass composed of fibrin and some large endothelial cells in fatty degeneration, much like the clear variety of Bennett's corpuscles.

Nowhere was seen the concentric arrangement of muscular bundles characteristic of common myomas of the uterus.

The cavities presented an entirely smooth, shining surface, resembling that of an organ covered with peritoneum or the interior of a blood-vessel. The lining membrane was easily torn from the surrounding uterine tissue, and was one millimetre thick. By scraping, large flakes were obstained, showing that the cavities were lined with a uniform *endothelium*, composed of similar flat cells as those seen in the large cyst.

A piece of the cyst from which the fluid was taken, was hardened in Müller's solution and alcohol, and sections taken from it. It did not show any trace of smooth muscle fibres. Innermost was, in many places, found the endothelium observed when the specimen was fresh. The inner part of the wall proper was

composed entirely of very large cells, with wing-like prolongations in all directions, lying in an amorphous basis-substance. The outer part was composed of longitudinal connective tissue fibres with few interspersed cells.

Sections from that part of the tumor, which contained many small cysts, showed a great many cavities, some of which were recognizable as blood-vessels by their thick walls, regular shape, and sometimes the presence of red blood-corpuscles. These openings were few and small. Another kind of cavities were very irregular in shape, sometimes mere long fissures, at other times of more roundish appearance. These had no separate wall, except that in some an endothelial lining was visible. The surrounding tissue was composed of smooth muscle-fibres.

The *ascitic fluid* evacuated from the peritoneal cavity was of a dirty yellowish-red color with white flocculi. This fluid did not coagulate immediately as that from the cyst, but some hours later, the fluid having been standing undisturbed, a coagulum had been formed which was almost as large as the whole mass and surrounded by a small quantity of citrine fluid. Next morning it had shrunk to half its size, was lying on the bottom of the vessel, and had a reddish-yellow color like an apricot. The fluid surmounting it was perfectly clear, citrine, alkaline, specific gravity 1022. Boiling alone caused some precipitation, and on addition of a drop of acetic acid the whole mass became firm, but this coagulum was entirely redissolved by boiling with acetic acid in excess.

The coagulum found in the untouched fluid had so little cohesion, that it was easily mixed with the fluid by shaking, although it was coherent enough to be raised with a spoon and folded. The shaken fluid contained, first, many red blood-corpuscles; second, flakes of flat, roundish epithelial cells in a state of more or less pronounced fatty degeneration, *i. e.*, with small black, or larger, clear circular granules. Most of the cells had a distinct nucleus, the largest being sixteen μ in diameter with a nucleus measuring eight μ. Third, numerous lymphoid bodies without amœboid movements were found. As in many cases the nucleus of the endothelial cells was seen quite plainly while the body was almost dissolved, and as these nuclei appeared exactly like what we have called lymphoid bodies, it is probable that many of them, at least, had this

origin. After the coagulum had been mixed with the fluid, the specific gravity had risen to 1024.

According to Atlee's book, the *diagnosis* of uterine fibro-cysts by the fluid would be an easy matter, for it is said to have two entirely characteristic properties. It coagulates in the course of a few minutes to one solid mass, so that the bottle can be turned without spilling a drop, and no other abdominal fluid has this property.[1] Secondly, it contains in most cases a spindle-shaped cell which likewise is pathognomonic, being simply a smooth muscle-fibre detached from the wall of the cyst in which the fluid is contained.[2] Unfortunately these statements are not borne out by the experience of other observers. It is true that this instantaneous and total coagulation without the addition of any chemical agent, by the mere exposure to the air, is very different from the coagulation which exceptionally has been observed in ovarian cyst-fluid and from that found, as a rule, in ascitic fluid (see below), but this phenomenon seems to be rather the exception than the rule with uterine fibro-cysts. Heer has collected sixty-five cases from literature, in ten of which only coagulation is said to have taken place, and he describes five new cases from Frankenhäuser's clinic. Out of three submitted to extirpation or tapping, one only contained a rapidly coagulating fluid. Of the cases published since Heer's treatise, the characteristic coagulation took place in Fehling and Lepold's, Spiegelberg's,[3] and Rein's cases, while Trenholme merely found pus, Kimball[4] fifteen and a half litres of a straw-colored, thin fluid, and Krassowsky[5] thirty-six pounds of dark, viscid fluid. The phenomenon of total and instantaneous coagulation is so striking, and has been laid so much stress on by Atlee in America and different European writers, that it is very unlikely that it should not be mentioned in every case in which it occurred. Howitz[6] states expressly that, in his case, he emptied seven quarts of fluid which did not coagulate in the test-tube.

[1] Atlee, l. c., p. 289.

[2] Ibid., p. 464.

[3] Spiegelberg in Archiv für Gynäkologie, 1874, vol. vi., p. 34.

[4] Kimball in Boston Med. and Surg. Journ. Schmidt's Jhb., 1877, vol. clxxvi., p. 35.

[5] Krassowsky: Schmidt's Jhb., ibidem.

[6] Howitz: Gynäkologiske Meddelelser vol. ii., p. 280.

We must now examine the *alleged cases of spontaneous coagulation of ovarian cyst-fluid*, because they are put in evidence as proving that no conclusion can be drawn from the spontaneous coagulability of a fluid. Virchow[1] says, in speaking of a modification of fibrin, which he calls fibrin with late coagulation ("Fibrin später Gerinnung"), that it is sometimes found together with colloid masses in ovarian tumors. In another place,[2] he gives some details of a case. The patient was punctured twice. At the first operation were withdrawn five quarts of a brownish fluid, which *began to coagulate soon* after being emptied, and contained much albuminate of soda and cells with fatty granules. At the second operation, undertaken four weeks later, ten quarts of a somewhat thinner, more yellowish fluid, with a specific gravity of 1017.2 were withdrawn, which also *began to coagulate spontaneously some time after being withdrawn*. At the autopsy, the two cysts that had given the fluid were seen to belong to what he calls a colloid tumor of the ovary, by which he only means a common ovarian cystoma. It will be noticed that the coagulation began some time after the fluid had been withdrawn, and that it is not stated to what extent it took place. It is, therefore, very likely that this process was a slow one, and limited to the formation of some fibrinous flocculi, as have been more minutely described in the following case of Schroeder's. This is so much more probable, as Virchow refers to the first quoted place where he had spoken of slowly coagulating fibrin, such as may be found in an old hydrocele.

In a patient of Schroeder's,[3] a fluid was withdrawn which is expressly stated to have had all the appearances of ovarian fluid. It was viscid, ropy, rather dark-brown, coagulated entirely on boiling, contained paralbumen, specific gravity 1020. *After it had been exposed to the air for about twenty-four hours, cloudy coagula formed, which slowly sank to the bottom.* The microscope revealed that they were composed of fibrin. Columnar epithelial cells were not found. The absence of these cells and the presence of fibrin weighed so much in the operator's mind that an operation was desisted from.

[1] Virchow: Archiv, Vol. i., p. 117.

[2] Virchow, in Verhandlungen der geburtshülflichen Gesellschaft in Berlin, Vol. iii., p. 217.

[3] Röhrig, in Archiv für klinische Medicin, xvii., p. 357.

The autopsy showed that the fluid was contained in an ovarian cyst the pedicle of which was twisted three times. I would remark about this case that, while the presence of columnar epithelial cells proves the cyst to be ovarian or a kindred cyst, their absence does not prove anything. The coagulation was of the late kind, not the instantaneous. Thus, nothing was found in this fluid which warranted the diagnosis of a uterine fibro-cyst.

The third case adduced is that of Spencer Wells.[1] This was a dermoid cyst with bones and hair. In some isolated cysts there was an emulsion of fat and cholesterin; in others, the albuminoid liquid so common in ovarian dropsy; and thirdly, in different parts of the large tumor, "certain small isolated bags full of limpid thin serum, which, being exposed to the atmosphere, soon coagulated, like any other serous fluid overcharged with fibrin." In this case, we will notice that the large cysts contained characteristic dermoid and myxoid ovarian fluid, and that the coagulating fluid seems to have been inclosed in small lacunæ of the solid mass. If an exploratory puncture had been made with an instrument of proper size, it is, therefore, not likely that the deceiving fluid would have been withdrawn.

This is illustrated by Olshausen's case.[2] Olshausen drew off fluid in two places with a hypodermic syringe. It was scarcely turbid, thin, light-yellow, and *coagulated immediately and completely.* The clot was like gelatin, and did not give off any serum on standing. Later, the same patient was tapped with a large trocar, and twenty-two pounds of fluid of a specific gravity of 1016 were withdrawn. This time nothing is said about its coagulating. At the autopsy was found that it was a cysto-sarcoma of the ovary, which was essentially a solid tumor, although containing many lacunæ and crevices. In this case, indeed, immediate and complete spontaneous coagulation took place, but the fluid was withdrawn from the solid part of the tumor, and besides it differed from Atlee's by not separating into a clot and serum after standing a while. Anyhow this case is a very important one, and shows as well as the preceding one that the quantity withdrawn by the hypodermic syringe is so small that no reliable diagnosis can be based on it.

[1] Diseases of the Ovaries, p. 133.
[2] Ovarienkrankheiten, p. 161.

Klob's [1] and Westphalen's [2] cases do not at all disprove Atlee's statement, for in both it is expressly stated that no spontaneous coagulation took place at any time. In Klob's, a few drops of blood were added to a part of the fluid, and the whole of this formed after three hours a thin jelly. In Westphalen's case, the fluid of the main cyst did not coagulate spontaneously, nor did that of a smaller cyst of the size of two fists, but, on addition of serum of blood, almost the whole mass formed one large coagulum.

Peaslee is also quoted as instancing spontaneous coagulation in ovarian cyst-fluid, but all we find in his book [3] on this subject as a list of chemical analyses of ovarian fluid by Becquerel, showing what the chemist himself calls "traces of fibrin," or reaching at most 0.071 per thousand. Here is not the least proof that these fluids showed any kind of coagulation, much less the instantaneous and complete one described by Atlee.

When, now, we review the evidence with regard to coagulation, we come to the result that, so far, all cases in which a sufficiently large quantity of fluid was withdrawn (a couple of ounces ought always at least to be taken), and coagulated spontaneously, promptly and completely, have proved to be fibro-cysts of the uterus; in other words, that Atlee's test has positive value. But, on the other hand, it has no negative value; that is to say, from the absence of this kind of coagulation cannot be inferred that the tumor in question is not a uterine fibro-cyst. The presence of a fluid which, after long exposure to the air precipitates fibrinous clouds, or gelatinizes on addition of blood or serum, does not prove that it comes from a fibro-cyst.

As for Atlee's second test, the presence of the fibre-cell,[4] I find it mentioned in only one case, Frankenhäuser's first.[5] It may, of course, have been present in many others, and it is very likely that it would be found in those cases in which there is no epithelial layer on the cyst-wall, and the fluid is in immediate contact with the smooth muscle-fibres of which the uterine tissue is chiefly composed. That it is not always found

[1] Klob: Pathologische Anatomie der weiblichen Sexualorgane. Wien, 1864, p. 357.
[2] L. c., p. 85.
[3] L. c., p. 38.
[4] Atlee, l. c., p. 464.
[5] Heer, l. c., p. 23.

appears even from Atlee's own experience. In fact, of his four cases, it is only mentioned in one (case lxxvi.). In case lxxvii., it is expressly stated that microscopical examination did not reveal any objects. In case lxxix., the serum contained only a few blood-corpuscles, fragments of tissue undergoing fatty degeneration, etc. In case lxxx., no mention is made of the microscopical elements.

If the fibre-cell is not always found in uterine fibro-cysts, on the other hand it may be found in ovarian cysts. I found it in great number in my case xv., which was a myxo-fibromatous cyst of the ovary (see p. 26), in which the wall in many places was composed of such cells. Dr. M. D. Mann,[1] of Hartford, Ct., my predecessor as pathologist of the New York Obstetrical Society, found similar cells in the fluid of a case of ovarian cystoma, containing in many places large bundles of smooth muscle-fibres.

The other cellular elements which have been found in uterine fibro-cysts were epithelial cells, shrunken, or in fatty degeneration (Bennett's corpuscles). This corresponds with the fact that De Sinéty,[2] who has so great a merit for having investigated the microscopy of gynecological diseases, has found pavement epithelium in these cysts, and Rein (l. c.) and others, as well as myself, have found an endothelium on the walls. In most cases, competent observers have failed to find any kind of epithelial lining.

None of the microscopical elements found have any diagnostic value. We notice only that columnar epithelial cells, such as are characteristic for cysts of the ovary or broad ligament, have never been found in uterine fibro-cysts.

9. *Amniotic Fluid.*

If there be any suspicion of pregnancy in a given case, tapping of the uterus ought, of course, not to be thought of, but, since such cases have been unexpectedly found in performing ovariotomy, it might also happen that amniotic fluid was obtained by exploratory puncture, and we must, therefore, describe it.

In case xxviii. of the list of tapped fluids, I collected the

[1] Transactions of the New York Obstetrical Society, Vol. i., p. 100, 1879.

[2] Manuel de Gynécologie, p. 415.

liquor amnii at the moment of the breaking of the waters in a normal pregnancy at term. It was of a dirty yellowish-gray color, serous, turbid, full of small white flocculi, alkaline, had the odor peculiar to the female genitals, did not coagulate spontaneously, nor on boiling, but it did so on boiling with a drop of acetic acid. The precipitate was not changed by boiling with excess of acetic acid, but became much clearer by adding potassa.

The microscope revealed the presence of oil-globules, irregular fat-granules, large flat cells (Fig. 48), 48 μ long by 21

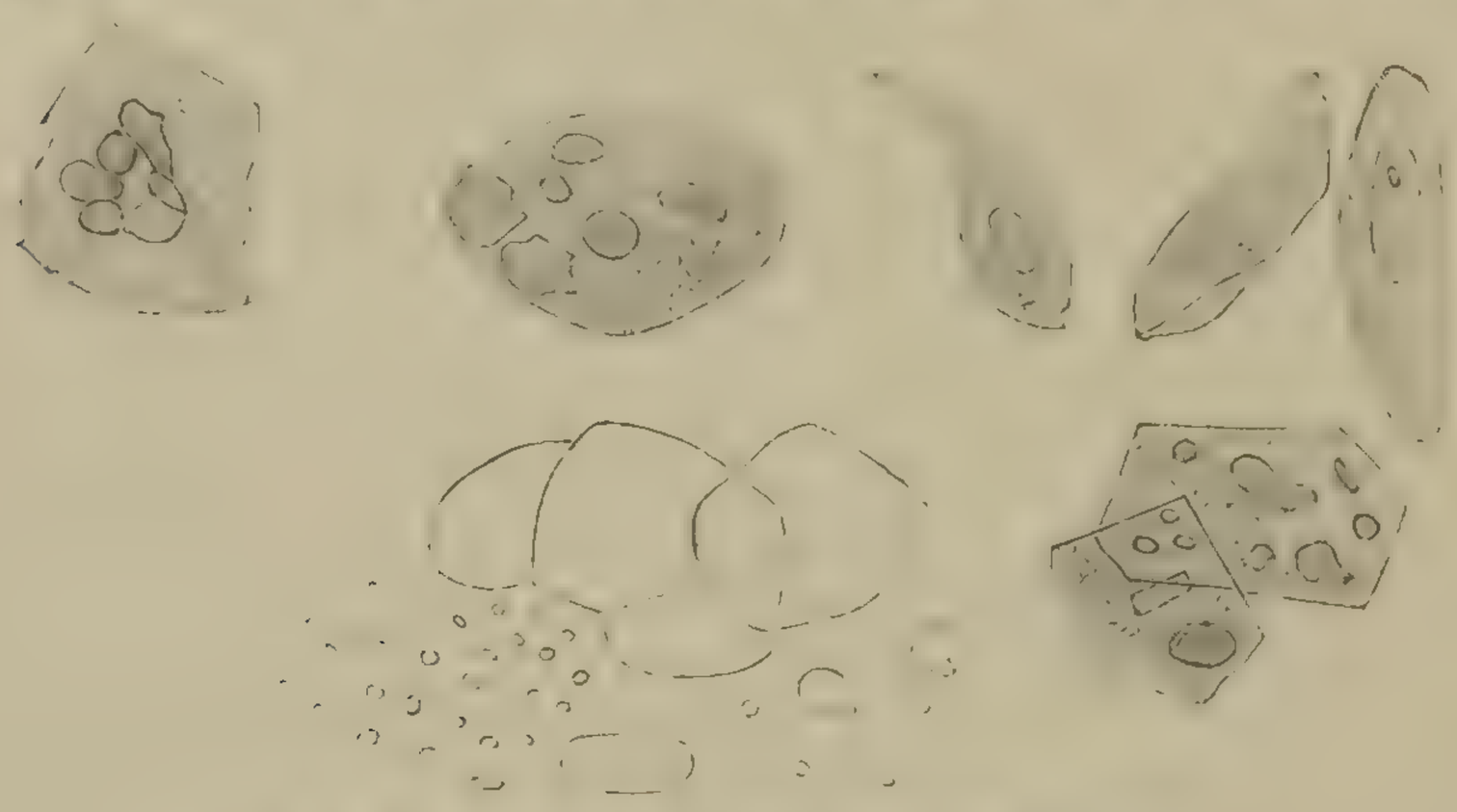

FIG. 48.—Epidermal Scales in Liquor Amnii.

FIG. 49.—Liquor Amnii Cells, the Fat of which has been drawn out with Ether.

μ in thickness, containing fatty masses like those found free in the fluid. Often these cells were found in groups, and seen to cover one another partially. The fatty mass was sometimes much like bits of paraffin sticking to microscopical specimens. When ether was poured on a drop of the fluid, the fat was drawn out of the cells, which then looked shriveled, and showed an irregular meshwork (Fig. 49); in some, a nucleus was visible.

The fatty masses in and outside of the cells differed entirely from all that I have seen in any other fluid, and they would be sufficient for a diagnosis. I take all the cells to be changed epidermal scales. The amnion itself is indeed covered with an epithelium, but there the cells never overlap one another, and are short columnar, not flat.

10. *Dropsy of the Fallopian Tube.*

The dropsy of the Fallopian tube is a disease of extremely rare occurrence, especially those cases in which the cyst becomes large enough to form a tumor. Scanzoni [1] has described one which had the size of the head of a child ten years old. The correctness of the diagnosis is doubted in all cases which are said to have contained many pounds or quarts of fluid.

Klob [2] says that the fluid usually is a thin light-yellow serum. In large collections especially it has almost always this character. In many cases it contains a large amount of small scales of cholesterin. In less developed degrees of the disease, the fluid, from more or less considerable admixture of blood, may be brownish, greenish-brown, or even black as ink, thick, mucous, and ropy. This is corroborated by A. Meadows' case, in which there were three small cysts, the fluid being dark, thick, grumous, of a prune-juice color.[3] Foerster [4] gives a similar description as Klob, only adding that sometimes the fluid is turbid from suspended flocculi. Peaslee [5] says that it contains mucus and but little albumen; Koeberlé,[6] that it contains albumen but no paralbumen, so that the precipitate formed by nitric acid is rather increased by acetic acid.

The only case I find with a report on the microscopical properties is that of Frankenhäuser,[7] described by Hausammann. By pressure on the tumor, half an ounce of clear, blood-colored serum was pressed out through the os into the speculum. It contained scarce fresh or shrunken red blood-corpuscles, a little pavement epithelium, but no vibratile cells. If the description of the epithelial cells is correct, they must have changed character by pressure, but, as in ovarian cysts, where the pressure is probably at least as great, I have found the columnar character preserved without exception, I do not feel quite convinced of the correctness of the observation.

[1] Scanzoni: Krankheiten der weiblichen Sexualogane. Wien, 1857, p. 318

[2] Klob, l. c., p. 290.

[3] Meadows, in Trans. Obstet. Soc. London, Vol. viii., p. 141.

[4] Foerster: Pathologische Anatomie, vol. ii., p. 397. Leipzig, 1863.

[5] L. c., p. 156.

[6] Koeberlé: paper read before the Med. Soc. of Strassburg, Nov. 15th, 1875; Obstet. Journ. Gt. Br. and I., Vol. iv., p. 277.

[7] Bandl: Krankheiten der Tuben, etc., p. 21. Stuttgart, 1879 (Billroth's Frauenkrankheiten, v.).

It would appear from these data furnished by pathologists and clinicists that the fluid is so little characteristic that no diagnosis can be based on it. The clear, serous fluid might be like that found in cysts of the broad ligament and some ovarian cysts. The presence of paralbumen would argue in favor of an ovarian cyst. The bloody or dark-colored, thick fluid must be much like that found in many cases of uterine fibro-cysts. But since large tumors of hydrosalpinx are so exceedingly rare, an examination of the fluid would so rarely lead to an erroneous diagnosis, that it cannot detract much from the value of this means of diagnosis.

11. *Lymphangiectatic Myoma of the Round Ligament.*

Leopold [1] has described a large tumor which he takes to be a lymphangiectatic myoma of the round ligament. In this case, the fluid was thick, yellowish-brown, coagulated very easily on exposure to the air or to heat. In other words, it had exactly the same physical characters as similar tumors found in the uterus. The microscopical appearance is not stated.

12. *Cysts of the Abdominal Wall.*

As a rule, there will be no difficulty in distinguishing ovarian cysts from those situated in the wall of the abdomen, but in operative case vii., occurring in Dr. C. C. Lee's service at the Woman's Hospital, the diagnosis was somewhat doubtful. The womb was enlarged, and the fluctuating, noduled tumor, of the size of a fist, situated in the hypogastric region, which had been developed in the course of two years, seemed to move with it. It was a cyst situated immediately below the subcutaneous fascia, from which it could be separated by finger and scalpel. The posterior wall was so intimately connected with the sheath of both recti muscles, that part of it had to be cut away, exposing both muscles bare at the bottom of the wound. The inner surface appeared in some places smooth, but most of it was covered with fleshy shreds which formed a kind of cobweb bridges, going from one point to another. In some places this growth formed a continuous red membrane ("membrane pyogénique" of the French). It consisted of connective tissue

[1] Archiv für Gynäkologie, 1880, vol. xvi., p. 406.

crowded with inflammatory elements. There was no epithelium.

The fluid was purulent. It consisted of pus-corpuscles and some bodies entirely like Drysdale's ovarian cells. These were evidently the pyoid bodies described by Lebert. They were quite pale, contained a few clear granules, and acetic acid had scarcely any effect on them. But, as no kind of epithelial cells were found, the fluid differed from that found in my two cases of ovarian cysts (page 25. Even case iv. contained some).

Serous and bloody cysts may also be found in the subcutaneous layer of the wall of the abdomen. Similar cysts may be situated between the muscles and the peritoneum, both in the anterior and the posterior wall. Their fluid is, of course, quite different from that of ovarian cysts.

Exceptionally these cysts of the abdominal wall acquire such proportions that it would be very embarrassing for a man who had not seen the development of the case to tell them from intraperitoneal abdominal tumors. Thus Chantoureille[1] describes one which covered almost the whole abdomen. By tapping, two pounds of albuminous, inodorous, transparent, limpid fluid of a beautiful lemon-color were withdrawn. No microscopical examination is mentioned, but the physical appearance, besides the comparatively small quantity of fluid coming from a tumor which seemed to fill the abdomen, would be enough to exclude an ovarian cyst.

Cruveilhier[2] describes a case of a subperitoneal serous cyst in the left lumbar and iliac region, and adds that, if he had seen it in the patient's lifetime, he certainly would have taken it for an ovarian cyst. It was filled with a limpid, serous fluid. Since this was found in a cavity formed in the connective tissue surrounding the left kidney, it cannot have contained other formed elements than some leucocytes, and there is, therefore, scarcely a doubt that it would have been possible by the examination of the fluid to exclude an ovarian cyst.

Under the name of encysted aqueous tumor of the kidney, Hawkins[3] has described a tumor which seems to have been something like this, since the kidney was healthy, but its ante-

[1] Chantoureille in Archives Générales de Médecine, 1831, vol. xxvii., p. 218.

[2] Cruveilhier: Atlas d'Anat. Pathol., vol. iii., p. 508.

[3] Hawkins in Medico-Chirurgical Transactions, xviii., p. 175, 1833.

rior surface formed, as it were, part of the cyst. In this case the fluid amounted to five pints, was nearly transparent, contained a good deal of white semi-purulent matter, but *did not coagulate by heat.* The author states expressly that it was not a hydatid.

13. *Cysts of the Urachus.*

There is a kind of cyst in the anterior abdominal wall which deserve to be mentioned in particular. Cysts formed in the urachus, that remnant of the allantois, which normally is a mere thin ligamentous string extending from the top of the bladder to the umbilicus, acquire sometimes such proportions as to be easily taken for ovarian cysts. They even seem not to be excessively rare. Hoffmann[1] has described two cases, one of which at the autopsy contained fifty litres of fluid, Wolff[2] one, and Roser[3] two. Wolff thinks that many a cyst has been extirpated and thought to be ovarian, which really was a urachus cyst. He thinks even that the cases mentioned by Spencer Wells[4] of ovarian cysts without pedicle were cysts of the urachus; but in this he is evidently mistaken, for Spencer Wells states expressly that in his first case there was not even any adhesion to the abdominal wall, and the second was a dermoid cyst.

Hoffmann gives the best description of the fluid. In his first case the microscope revealed a large amount of cholesterin, red blood-corpuscles, and débris. The inside of the cyst was lined with flat epithelium. In the second case, the cyst suppurated and broke, discharging a bloody, purulent fluid which contained onion-like balls of conglomerated flat epithelial cells. In Wolff's case, there was an abundant deposit of pus and débris. In Roser's first case, there was a communication with the bladder, so that the fluid was urine. In his second, which he took for an ovarian cyst, he extirpated a cyst as large as the head of an adult. The fluid was sero-purulent.

It appears from the above that when the fluid was well examined, even when purulent, it differed from that of ovarian cysts by containing flat epithelial cells.

[1] Hoffmann in Archiv für Heilkunde, vol. xi., p. 373, seq., Leipzig, 1870.

[2] Wolff: Dissertation. Marburg, 1873. Abstract in Langenbeck's Archiv, vol. xx., p. 477, 1877.

[3] Roser in Langenbeck's Archiv, vol. xx., p. 472, 1877.

[4] Diseases of the Ovaries, pp. 84, 85.

Roser describes on the same occasion a cystic tumor which from its position at the navel he thought was a urachus cyst, but which, on microscopical examination by the celebrated anatomist Lieberkühn, was found to be lined with the kind of glands which in the intestine bear his name, and which, therefore, was interpreted as a *cyst of the vitelline duct.* It had a diameter of six centimetres, and discharged through the umbilicus a mucous fluid containing columnar epithelial cells. Such a fluid, then, would be so like ovarian that it would scarcely be possible to distinguish them. But the case so far is unique and the patient was a man.

14. *Spina bifida.*

Dr. Emmet[1] reports a rare case of *spina bifida* forming a tumor in the pelvis, which had the appearance of an ovarian cyst. At the autopsy there was found a large opening in the anterior part of the sacrum, through which a sac communicating with the spinal canal had entered the pelvis. The fluid drawn off in the life-time of the patient was serous, perfectly clear and limpid, "resembling hysterical urine. It contained no albumen, and the microscope revealed nothing but a few oil-globules, which had beyond question been attached to the instrument before its introduction." It was consequently entirely different from that of ovarian cysts.[2]

[1] Gynecology, p. 79.

[2] Since this treatise was finished, a case, which is much like Dr. Emmet's, has occurred in Spiegelberg's clinic, and is most excellently described by Kroner and Marchand, in Archiv für Gynäkologie, vol. xvii., 3, pp. 444 to 474. Only, I am surprised that the authors have entirely overlooked Dr. Emmet's case. Before anything in gynecology is called "unique," it is wise to look for it in the work of a man who has perhaps a larger personal experience in this department than any other. Spiegelberg's case has particular interest for us because the fluid was examined twice. When the sac first was emptied by puncture, it contained three litres of colorless, limpid, thin fluid, with alkaline reaction, specific gravity 1007, traces only of albumen, mucin, no paralbumen, no sugar. The microscope did not reveal any kind of formed elements. Ten days later, the cyst having refilled under high fever, it was opened by an incision into the vagina, and now the fluid contained numerous red blood-corpuscles, some granular cells, and many large flat cells like those of the peritoneal endothelium. At both occasions, then, it differed in chemical and microscopical characters from that of ovarian cysts.

15. *Hydatids* (*Echinococci*).

Hydatids have been found both in the uterus and the ovary, and, even when they are developed in other parts of the abdomen or in the abdominal wall, they are often exceedingly like ovarian cysts.

The character of the fluid is in many cases the only means of diagnosis. Its aspect is not characteristic. It is colorless, opalescent, or yellow, clear or turbid. It is either without albumen, or contains only traces of it. We have seen the same in some ovarian cysts. But in the fluid of ecchinococci are found succinic acid,[1] leucin,[2] grape-sugar, and inosite.[3] Baldini[4] found uric acid and urea in an echinoccus, situated in the retroperitoneal connective tissue below the right kidney The microscope may reveal hooklets from the *scoleces*, or young tape-worms, developed in the interior, or particles of the *cuticula*, *i. e.*, the membrane of the sac, which is easily recognized by being formed of fine parallel, structureless layers presenting the utmost regularity. Dr. Chadwick[5] has pointed out that these are not affected by acetic acid, in which respect they differ from layers of fibrin found in coagula.

A single hooklet or the smallest piece of cuticula i pathognomonic for an ecchinococcus, but they are not always found. I have reported a case of a hydatid in the liver,[6] which was tapped twice. At the first tapping no microscopical elements were found, but the second furnished numerous hooklets and heads of echinococci. We have seen that ovarian fluid may be clear, colorless, and free from albumen, but even the clearest I have found contained fat-globules and paralbumen (case xxxiii.). I think, therefore, that the diagnosis can be made with certainty, either by aid of the microscope or of chemistry.

[1] Gorup-Besanez: Handbuch der physiologischen Chemie, p. 274. Braunschweig, 1862.

[2] Westphalen, l. c., p. 90.

[3] Naunyn and Wyss quoted by Waldeyer, Archiv für Gynäkologie, vol. i., p. 273.

[4] Baldini, Centralblatt für Gynäk., 1878, vol. ii., p. 512.

[5] Freund and Chadwick: Four Cases of Echinococci in the Female Pelvis, Am. Journ. Obstet., Feb., 1875. Reprint, p. 12.

[6] Garrigues: Hydatids in the Liver treated by Cauterization. Proceedings of Kings County Society, July, 1876, p. 127.

16. *Cysts of the Mesentery.*

Dr. Robert Watts,[1] of this city, has removed a large cyst from the mesocolon of a woman, which was taken for an ovarian cyst, even after the abdomen had been opened. The fluid it contained was reported by Dr. Delafield to be clear serum. Thus a diagnosis from ovarian cyst could probably have been made by examining the fluid beforehand.

Péan[2] has removed large cysts of the mesentery in three cases. In the first, were found ten litres of a yellowish-brown turbid fluid; in the second, twelve litres of a serous, yellow, limpid fluid; in the third, fourteen litres of a fluid, the characters of which he does not state. In no case a microscopical examination is mentioned.

17. *Cysts of the Spleen.*

Cysts of the spleen must be of exceedingly rare occurrence. In all the extensive literature I have examined in order to collect materials for supplementing my own experience with cystic fluid, I have found only a single case, viz., that of Péan, who, thinking it was an ovarian cyst, removed it. It contained three litres of a thick, viscid, yellowish-brown fluid, in which were found a very considerable proportion of albumen, leucocytes, crystals of cholesterin, red blood-corpuscles in different degrees of alteration, and finally some calcareous granules. Péan says that it did not differ much from that met with in certain ovarian cysts, but the total absence of epithelial cells or their derivatives in so thick a fluid would show at once that it could not come from a cyst of the ovary.

18. *Cysts of the Liver.*

Leaving out of view echinococci of which we have spoken above, cysts in the liver are likewise exceedingly rare. Atlee thought his case xxxviii. was one. He withdrew by

[1] Watts in Transactions of Obstetrical Society of New York. AMERICAN JOURNAL OF OBSTETRICS, 1879, xii., p. 333.

[2] Tumeurs de l'Abdomen, pp. 1,111, 1,112 and 1,115.

[3] Tumeurs de l'Abdomen, pp. 1,006, 1,051, 1,056. Other cases of splenic tumors have been mistaken for ovarian cysts, but then the tumors were solid, combined with ascites.

tapping twenty-seven pints of cider-colored fluid, upon which floated a thick transparent oleaginous stratum, which was shown by the microscope to be composed of cholesterin. The underlying fluid coagulated by heat. But as the patient recovered, the diagnosis is not certain. At all events it is very unlikely that there could be any resemblance between this fluid and ovarian. The mere fact that no kind of bodies are mentioned except crystals of cholesterin, although the microscope was used, goes far to show that the fluid did not contain any microscopical elements resembling those commonly seen in ovarian fluid.

Atlee gives the history of another case (xxxix.) A boy was struck by the tongue of a fire engine in the right side below the ribs. A cyst formed from which were tapped fifteen and a half pints of a fluid which in color and consistence resembled bile. He died two months later, when a cyst was found occupying the greater part of the abdomen and dipping down into the pelvis. The common duct of the liver had been torn completely across and terminated in the cyst. It is not stated if the fluid had retained the same characters.

The presence of bile was made out by nitric acid in a case of Hawkins.[1] The same author quotes several other cases, and among them that of a young lady, in which the cyst contained sixteen pints of water,[2] and says that this was evidently an encysted aqueous tumor, not a hydatid. I fail to see why. So large a cyst in any abdominal organ might easily be taken for ovarian, but probably the diagnosis could be made by the characters of the fluid.

I have myself examined the fluid in one case (tapped case xxxvii.) which by the physician in charge, Dr. Arthur Townshend, was believed to belong to this category. The patient was a man who had been suffering from Bright's disease and jaundice. A tumor was recognized in the epigastrium which, having acquired large proportions in a fortnight, was aspirated, and yielded five pints of fluid. The fluid was greenish-brown, turbid, alkaline, spec. grav. 1013, of a most repulsive stinky odor. No spontaneous coagulation, a little by boiling, and more after addition of acetic acid. The coagula remained unchanged

[1] Hawkins: Encysted Aqueous Tumors of the Liver, in Med. Chir. Trans. 1833, p. 99.

[2] Ibid., p. 121.

in excess of boiling acetic acid. Being brought in contact with nitroso-nitric acid it showed the rainbow-colored rings characteristic of the coloring matter of bile. The microscope revealed a large amount of red blood-corpuscles, some round colorless bodies, which seemed to be colorless blood-corpuscles, and large globular or irregular polyhedric bodies full of pigment, mostly yellow, which may have been developed of the preceding class. No epithelial cells. The patient died two days later. The autopsy showed a large cyst with thin walls, situated between the diaphragm, stomach, left lobe of liver, and spleen. It was easily separated from all except the diaphragm, with which it was grown together. The gall-bladder contained a calculus, and another entirely obstructed the common duct. Since the whole body was icteric, the presence of bile in the cyst does not prove its development from the liver, and since it could be separated from the liver, it is not even very likely that it originated from this organ.

Dr. P. F. Mundé has informed me that he, a few years ago, tapped a case of unquestionable liver cyst. The patient was about 35 years old. The tumor was so large as to give the appearance of eight months' pregnancy. She was not icteric. The doctor took the tumor to be ovarian until he had aspirated some of the fluid with a hypodermic needle. It was clear, yellowish or light brown. Fuming nitric acid gave the characteristic concentric rings of rainbow colors due to the coloring matter of the bile, and the microscope revealed the presence of liver cells and granular matter. The diagnosis thus being settled by the examination of the fluid, the doctor advised abstinence from operative interference.

19. *Hydronephrosis.*

When the ureter is blocked up by a stone or simply mad impervious by a sharp bend, collections of fluid large enough to simulate ovarian cysts may be accumulated in the pelvis of the kidney. Spencer Wells[1] mentions three cases of the kind. In the first, he operated, believing to have to deal with an ovarian cyst; in the second, the diagnosis was made from the position of the intestine in front of the tumor, and proved by autopsy to be correct; in the third, he made an ex-

[1] Diseases of the Ovaries, pp. 211, 214 and 217.

ploratory incision. In the first case fifteen pints of fluid escaped. It had the appearance of pea-soup. No microscopical nor chemical examination is mentioned. In the second, five or six pints of yellowish pyoid fluid, with mucus floating in it, were removed, and, at a second tapping, there was "nothing characteristic" in the fluid. He does not state if it was examined with tests or the microscope. In the third case, twelve pints of fluid escaped through the canula. It was clear, light yellow, with a faint urinous odor, acid reaction, and specific gravity of 1006. Urea, urates, and chlorides were found in about the normal proportions of healthy urine. There were traces of uric acid. A very small amount of albumen and phosphates, but no traces of sugar could be detected. On microscopic examination, large numbers of red blood-corpuscles were seen, a few pus-cells, some squamous epithelial cells and granular cells, but neither tube-casts nor crystals.

The acid reaction, the large amount of urea, and the presence of squamous epithelial cells would have sufficed to make it certain that it was not an ovarian cyst.

Rayer,[1] who is the author of the name by which this disease now goes, has described a case in which both kidneys were affected. In the right kidney was found a fluid smelling of rotten eggs, and forming by standing an abundant white deposit. Its reaction was neutral. It contained albumen, mucus, and a large proportion of urea. The fluid in the left kidney was reddish and transparent, and contained likewise albumen and urea. No microscopical examination is mentioned. But the large amount of urea would suffice to exclude ovarian fluid.

A case described by Fränkel[2] was likewise quite characteristic. The fluid had a strong urinous odor, and dull straw-color. Reaction feebly acid. In the deposits were found pus-cells and flat epithelial cells. The fluid contained much albumen, a large amount of urea, but only few chlorides.

The acid reaction, the large amount of urea, and the flat epithelial cells would suffice to settle the diagnosis.

But other cases have presented much greater difficulties. The urea may become much diminished in amount. Thus in a case

[1] Rayer: Maladies des Reins, vol. iii., p. 502. Paris, 1841.
[2] Fränkel in Archiv für Gynækologie, vol. vii., p. 358, 1875.

described by Krause,[1] the fluid examined after death was feebly alkaline, of a specific gravity of 1000 [?]. One hundred cubic centimetres contained 0.33 grammes or per cent chlorine, 0.11 grammes or per cent albumen, and only 0.47 grammes or per cent urea, while J. Vogel[2] in a large number of examinations of normal urine found the average to be 23.3 per thousand or 2.33 per cent.

In this case the low specific gravity might, if correct, have excluded an ovarian cyst. No microscopical examination is mentioned.

Simon[3] has described a case in which the fluid contained very much albumen, merely traces of urea, and no uric acid. Red blood-corpuscles and their débris were the only microscopical elements. This latter circumstance might at least have awakened a strong suspicion that it could not be ovarian.

The small amount of urea present would be of no avail, for a small quantity of this substance has also occasionally been found in ovarian cysts. Röhrig[4] has given a detailed description of a patient of Schroeder's who is a good illustration of the fact that ignorance is sometimes preferable to half knowledge. Schroeder had from other signs come to the diagnosis of an ovarian cyst, but wanted to make it sure by the examination of the fluid just then so warmly recommended by Spiegelberg. It was found dark-brown, viscid, ropy, so rich in albumen that it coagulated entirely by heat. Specific gravity 1020. It contained paralbumen. So far everything looked like ovarian fluid. But then it was found that the fluid, having been exposed to the air for about twenty-four hours, cloudy coagula formed, which slowly sank towards the bottom. Recourse was had to the microscope, which showed the coagula to be fibrin, and failed to reveal any columnar epithelial cells. This spontaneous coagulation and absence of the cells characteristic of ovarian fluid was interpreted as a proof that the tumor was not ovarian, but a uterine fibro-cyst. It appears from earlier parts of this paper that the epithelial cells may be absent from true ovarian fluid and that this slow coagulation is not that characteristic of uterine fibro-cysts.

[1] Krause, in Archiv für klinische Chirurgie, vol. vii., p. 222, 1865.
[2] Gorup-Besanez, l. c., p. 525.
[3] Simon, in Berliner klinische Wochenschrift, 1869, p. 234.
[4] Röhrig, in Arch. für klin. Med., vol. xvii., p. 357.

To entangle the case still more, a small quantity of urea was found in the fluid. It was estimated at 0.05 to 0.1 per cent. This pointed towards hydronephrosis. It was declared impossible to arrive at a diagnosis, and no operation was performed. The patient died, and the autopsy showed that it was a cystoma of the right ovary, the pedicle of which was twisted three times. This case then teaches us that *a small amount of urea may be found in ovarian cysts.* On the other hand, we have just seen that the amount of urea in hydronephrosis may become very small.[1] Accordingly a small amount of this substance does not permit us to draw any conclusion, neither for the one nor the other of these two affections, while a large amount suffices to exclude an ovarian cyst. The microscope may solve the question. If flat epithelial cells are found in the fluid, as in Fränkel's case, it cannot be ovarian. If, on the other hand, columnar epithelial cells are found, it cannot be hydronephrosis. By these tests it will be possible to arrive at a diagnosis in almost every case. But it must be admitted that the case of Simon might leave the diagnosis a little doubtful, for we have seen that ovarian fluid may be devoid of all histological elements except a few granules which do not prove anything (case xxxiii.). The presence of *paralbumen* would not be sufficient to prove that the cyst was ovarian and not hydronephrotic, as shown by a case described by Schetelig.[2] The fluid removed by tapping weighed thirty pounds. It was viscid, moderately dark, slightly alkaline, specific gravity 1018. It contained very much cholesterin and paralbumen, besides chlorides and phosphates, no urea. Nothing is said about microscopical elements. It was thought to be ovarian, but the operation, followed by autopsy, showed that it was hydronephrosis.

Before leaving this topic we will add that Naunyn has found *allantoin* in an ovarian cyst.[3]

Wheeler,[4] of Boston, has described a case of hydronephrosis,

[1] Péan (Tumeurs de l'Abdomen, p. 266) says that it may disappear altogether, and refers to Cooper Rose's case, but this was not hydronephrosis, but a renal cyst, and will be spoken of in that connection.

[2] Schetelig in Arch. für Gynäk., 1870, vol. i., p. 416.

[3] Waldeyer in Archiv für Gynæk., Vol. i., p. 273.

[4] Wheeler, in Proceedings of the Gynecological Society of Boston, 1871, vol. v., p. 202.

in which he says that the fluid had neither the odor nor the characteristics of urine. After death there was found a cyst containing seven quarts of a thin, yellow, inodorous pus. If the fluid was simple pus, of course no diagnosis could be based on it, but since neither chemical nor microscopical examination is mentioned it is doubtful if a more thorough investigation would not have revealed the character of the cyst in which the fluid was contained. I have seen ovarian fluid which looked like pus, but did not contain anything but columnar epithelial cells. Dr. Geo. Chesmore, of San Francisco, has made a similar observation (oral communication).

20. *Cysts of the Kidneys.*

The cysts of the kidneys commonly remain small and pass unobserved before the pathologist finds them after death. But exceptionally they may acquire such dimensions that they may resemble ovarian cysts. Foerster[1] has seen one as large as the head of an adult, and Bêhier[2] found one which contained eight litres of fluid. Atlee reports two cases, the one (xli.) "resembling a unilocular ovarian cyst;" the other (xl.) if it had been in a woman would have presented "close resemblance to a multilocular ovarian cyst." Even the microscopical examination might have led into error. There was clinical evidence that the cyst opened into the ureter. The urine mixed with the cyst fluid was examined by Dr. Drysdale. "Under the microscope it was seen to contain plates of cholesterin, coagulated fibrin, blood-cells, oil globules, and great quantities of *granular cells which in appearance closely resembled those formed in ovarian fluid.*"[3] This cannot surprise us when we bear in mind that some classes of the tubules of the kidneys are lined with columnar epithelium, that is to say, the same variety as that of ovarian cysts, and that these so-called cells are liberated nuclei, whose cell-body has been dissolved. Here, then, for the first time in this long investigation we meet with a tumor which belonging neither to the ovary nor to the broad ligament may contain the characteristic epithelial cell or its derivatives.

[1] L. c., vol. ii., p. 497.
[2] Quoted by Péan, Tumeurs de l'Abdomen, p. 227.
[3] Italics are mine.

But this question of the epithelium of renal cysts needs still elucidation. Foerster[1] says that they have pavement epithelium and so does Rindfleisch[2]—men who as pathologists ought to know. On the other hand, Péan[3] says there are two kinds of renal cysts, urinary and serous, the first of which have the same kind of epithelium as the uriniferous ducts, *i. e.*, columnar; while the latter present the aspect of a serous membrane, "whose inner surface never exhibits the epithelial cells of the ducts." This means probably that they, like all serous membranes, have pavement epithelium.

The physical appearance of the fluid varies much. It is sometimes found clear and amber-colored, sometimes bloody and clotty (Cooper Rose[4]), sometimes as a yellow or brownish gelatinous mass (Rayer[5]), or like *café au lait* (Béhier), or it may be milky or purulent (Rayer).

As to chemical composition, it appears from the just mentioned division into two classes, that sometimes the fluid contains urea and uric acid, and sometimes not. Cholesterin is very common, and sometimes albumen, leucin, and tyrocin are found. Besides, there is a small quantity of the salts usually found in the blood and animal fluids.

It appears, then, that, in the majority of cases, we will be likely to find either flat epithelium or a large amount of urea, both of which exclude an ovarian cyst, but that there may be cases in which the fluid is very like ovarian. Nevertheless the characteristic histological element, columnar epithelial cells, have never been found in the fluid taken from renal cysts.

Through the kindness of Dr. Noeggerath, I have obtained some fluid taken from a renal cyst (tapped case xxxii.). The tumor had the size of the uterus at eight months' pregnancy, and was taken to be ovarian. Dr. Noeggerath was present at the operation. It was a polycystic tumor of one of the kidneys. The fluid is one of the most interesting I have exam-

[1] Foerster, l. c., vol. ii., p. 497.
[2] Rindfleisch: Pathologische Gewebelehre, p. 460.
[3] Tumeurs de l'Abdomen, p. 222.
[4] Henry Cooper Rose, in Med.-Chir. Trans., vol. li., p. 167, 1868.
[5] Rayer, l. c., vol. iii., p. 508.

ined, and well apt to explain that some people declare the diagnosis of ovarian cysts by the character of the fluid to be an impossibility. It shows, indeed, that the characters upon which most reliance has been placed, at least in this country, are fallacious. But, at the same time, it proves that the diagnosis between renal and ovarian cyst can be made by aid of the microscope. The fluid was light-brown, gray, turbid, like coffee with much milk. Reaction feebly alkaline. The quantity at my disposal was too small to take the specific gravity. It was not at all viscid, which so dark ovarian fluid always is. It did not coagulate spontaneously, coagulated almost entirely by boiling, and the coagulum was redissolved by excess of boiling acetic acid, forming an opalescent fluid. Under the microscope, the resemblance to ovarian fluid was striking. The field was crowded with bodies which were entirely like Drysdale's "ovarian cells," my "nuclei with shining fat-globules." Besides these, were found some of the large Bennett's corpuscles represented in Fig. 5 *d*. There were also some epithelial cells in beginning fatty degeneration, much like those of ovarian cysts (Fig. 50). But here the resemblance stops. By paying closer attention to the smaller bodies, I found that they were of two different kinds. The majority were identical with the nuclei in fatty degeneration, which we find in ovarian cysts. A smaller number, but still a great many, were not nuclei, but cells, as proved by the existence of a distinct nucleus in their interior (Fig. 51). These cells were slightly angular, mostly 7 or 8 μ in diameter, but some as much as 11 μ. I take them to be the *epithelial cells we find in the convoluted and straight tubules of the kidney.* I compared them with the epithelial cell on slides containing nephritic urine, and found them exactly alike. These are *short* columnar, or, as Kölliker[1] has it, they approach only the columnar form, and are entirely different from those found in ovarian cysts, whose length is two or three times larger than their width, or still more (Fig. 4). There was not found a single long columnar epithelial cell. By examining the cells while they were tumbling over, their shape was plainly seen as that

[1] Kölliker: Gewebelehre des Menschen, 5te Aufl. Leipzig, 1867, p. 498.

of an irregular polyhedric body, with no marked difference in the length of the different diameters. I saw only a single cell with double nucleus. Furthermore, there were found a few larger cells (Fig. 52), measuring 16 μ in diameter. The body was light-gray and entirely free from granules of any kind. Each had a nucleus measuring 8 μ in diameter, and containing small black dots and clear globules. This nucleus was identical with those swimming free and forming the majority of the corpuscles. The origin of these is then easy to understand. The epithelial cells of the kidney becomes edematous, their nucleus undergoes fatty degeneration, the body is gradually dissolved, and the nucleus remains.

The fluid contained small yellowish-red, rhomboid or barrel-shaped crystals of uric acid (Fig. 53). It contained also quite a number of bodies of a beautiful orange color, resembling threads, always ending in a pretty little brush. I have no idea what this can have been. It was not like any crystal I know of, nor cotton, linen, woolen, or silken fibres, but I suppose anyhow that it was some accidental admixture.

It contained, furthermore, irregular masses with a fatty appearance, like paraffin, but of a greenish color, and, finally, very small circular bodies with a clear centre, sometimes with a

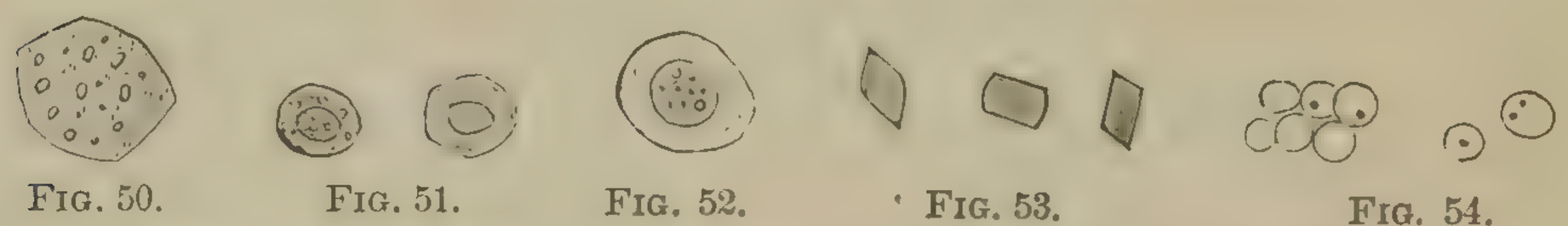

FIG. 50. FIG. 51. FIG. 52. FIG. 53. FIG. 54.

FIG. 50.—Epithelial Cells in Fatty Degeneration from Renal Cyst.
FIG. 51.—Epithelial Cells from Uriniferous Ducts.
FIG. 52.—Edematous Epithelial Cell from Renal Cyst.
FIG. 53.—Crystals of Uric Acid.
FIG. 54.—A Kind of Coccus ?

granule or two, but never with any trace of a nucleus. They were rather like oidium (Fig. 54). They were smaller than red blood-corpuscles, colorless, and without central depression. I suppose this was some kind of microbion.

On addition of *acetic acid*, the nucleus of the epithelial cells of the kidney became more distinct. The free nuclei in fatty degeneration were scarcely changed by it.

Ether mixed badly with the fluid. It seemed to dissolve the cells. They became more transparent, less distinct, some

barely visible. But in many, both large and small, the round clear globules and black dots remained.

This fluid, then, differed from ovarian fluid by the presence of epithelial cells characteristic for the kidneys, and of uric acid. Dr. Mettenheimer, a practical chemist of this city, examined a sample for me, and reported that it showed the reactions characteristic of *urea*.

This manuscript was already in the printer's hands, when I had the good fortune myself to see a myxo-fibromatous renal cyst extirpated by Dr. Thomas (operative case lviii.). The solid part weighed six pounds, the fluid five and a half pounds. A detailed description of this interesting case will be found in the Transactions of the New York Obstetrical Society (*New York Medical Journal*, February, 1882, pages 186 to 188). It was supposed to be ovarian before the abdomen was opened. Mere inspection of the fluid, as it flowed from the canula, was enough to satisfy me that it was not ovarian. It was reddish-yellow, clear, watery, like concentrated urine; it had no odor, did not coagulate spontaneously, became solid by boiling heat, the coagulum remaining unchanged in excess of boiling acetic acid. The specific gravity was 1022. On standing, the fluid separated into three zones: a thin layer of blood at the bottom, a thick cloudy layer in the middle, and a perfectly clear urine-colored at the top. The microscope revealed a great amount of red blood-corpuscles, small polyhedral cells undergoing fatty degeneration, like Bennett's large corpuscles, but considerably smaller, large, empty flat cells, shreds of connective tissue, no Drysdale's corpuscles.

21. *Cysts of the Pancreas.*

Pancreatic cysts of surgical dimensions are exceedingly rare. A few have been found in autopsies, but I have been unable to find that any has been operated before, nor that even the possibility of mistaking one for an ovarian cyst has been mentioned. The first part of this treatise was already printed, and the second in type when my material received a valuable addition (operative case lix.) by Dr. Nathan Bozeman's extirpation of a large cyst of this kind. For the clinical and oper-

ative, as well as anatomical, details of this rare case I refer the reader to the report in New York *Medical Record*, 1882, p. 46, and my paper, *ibidem*, p. 286. Here we have only to deal with the fluid and the surface which secreted it.

The cyst and fluid together weighed twenty and a half pounds, and the fluid measured two and one-half gallons.

The fluid looked entirely like that of the most common myxoid ovarian cysts. It was yellowish-gray, viscid, had a specific gravity of 1020, acid reaction, no smell. It did not coagulate spontaneously, but considerably by boiling. The acid reaction is very strange, and I would state that it was not ascertained until twenty-eight hours after the operation, bu the fluid had been kept in a vial with a well-fitting glass stopper, was quite fresh, had no odor, and did not contain any

FIG. 55. —Thready cell-débris in Pancreas Cyst.

bacteria. Some ovarian fluid which had been standing several days in a similar vial, was alkaline.

The microscope revealed, 1st, pigmented Bennett's corpuscles; 2d, innumerable small granular bodies with dark granules, like some of the nuclei found in ovarian fluid (Fig. 20). 3d, epithelial flakes in a semi-dissolved condition, including the above-mentioned pigmented bodies; 4th, innumerable irregular bodies composed of a few short threads. The examination of the fluid in a secondary cyst proved them to be débris of the bodies of the epithelial cells. No nuclei with shining granules nor epithelial cells were found in the fluid.

This fluid differed from ovarian fluid by the presence of the thready bodies, by the very small and uniform size of the nuclei, and by the acid reaction.

The cyst was, surgically speaking, a monocyst, but in several places were seen secondary cysts as large as a small hen's egg.

On opening one of these, a clear fluid like raw albumen flowed out, which only contained nuclei, melting epithelium, pigmented Bennett's corpuscles, and red blood-corpuscles. But

from the same compartment came a deposit composed of a brownish-gray thick fluid, which was full of pigmented Bennett's corpuscles and columnar epithelial cells. This fluid could not be distinguished from that of an ovarian cyst, and the microscopical examination of the hardened wall showed also a similar structure as that of ovarian cysts.

The inner surface formed cup-like depressions separated by tongues, all covered with goblet-shaped epithelium (Fig. 56). In some places were found closed pouches filled with epithelial cells. Several such pouches were found one beneath the other,

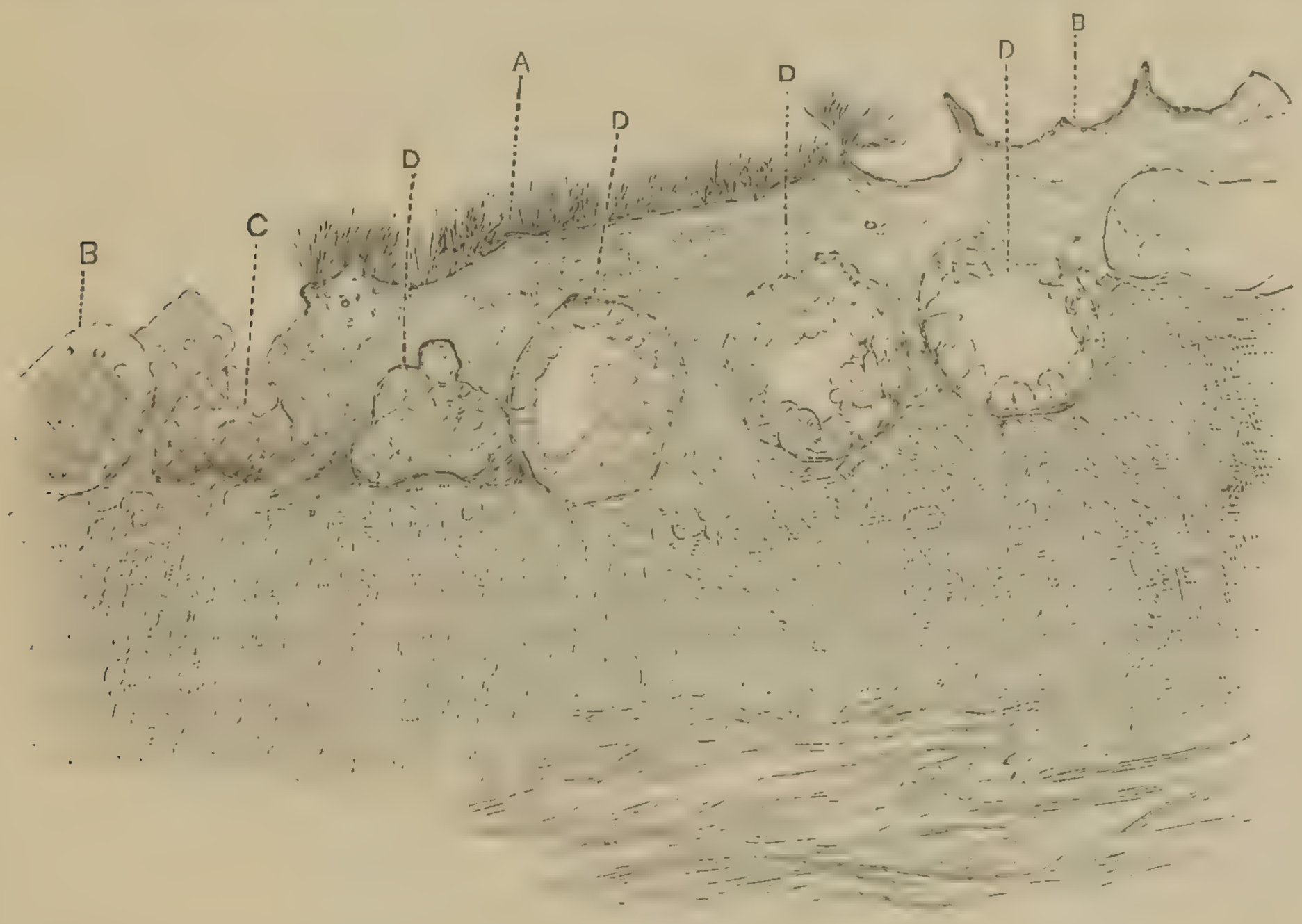

FIG. 56.

Pancreas Cyst; A, Surface epithelium; B, cup-shaped depressions separated by tongues. The epithelium lost during preparation. C, Epithelial pouch still in connection with surface; D, Epithelial pouches all surrounded by connective tissue with numerous cells (× 120).

exactly as in proliferating ovarian cysts. The smaller of these pouches had no lumen, but in the larger there appeared a cavity.

The epithelium seen in front view was composed of cells with four, five, or six sides. Seen in side view the cells showed a small nucleus at the lower end. They were long and thin, but broader at their upper end, which appeared to be open (Fig. 57). In many places it was seen how the epithelium began to form pouches. The whole formation of secondary cysts is exactly the same as in ovarian cysts. The epithelium forms pouches which at first are open. The connective tissue rises,

by an abundant cell proliferation, like a wall all around such a pouch, until it surrounds it altogether. Then we have a closed pouch filled with epithelium and surrounded by connective tissue, and after that the same process is repeated, forming several rows of closed pouches, which in the course of time be-

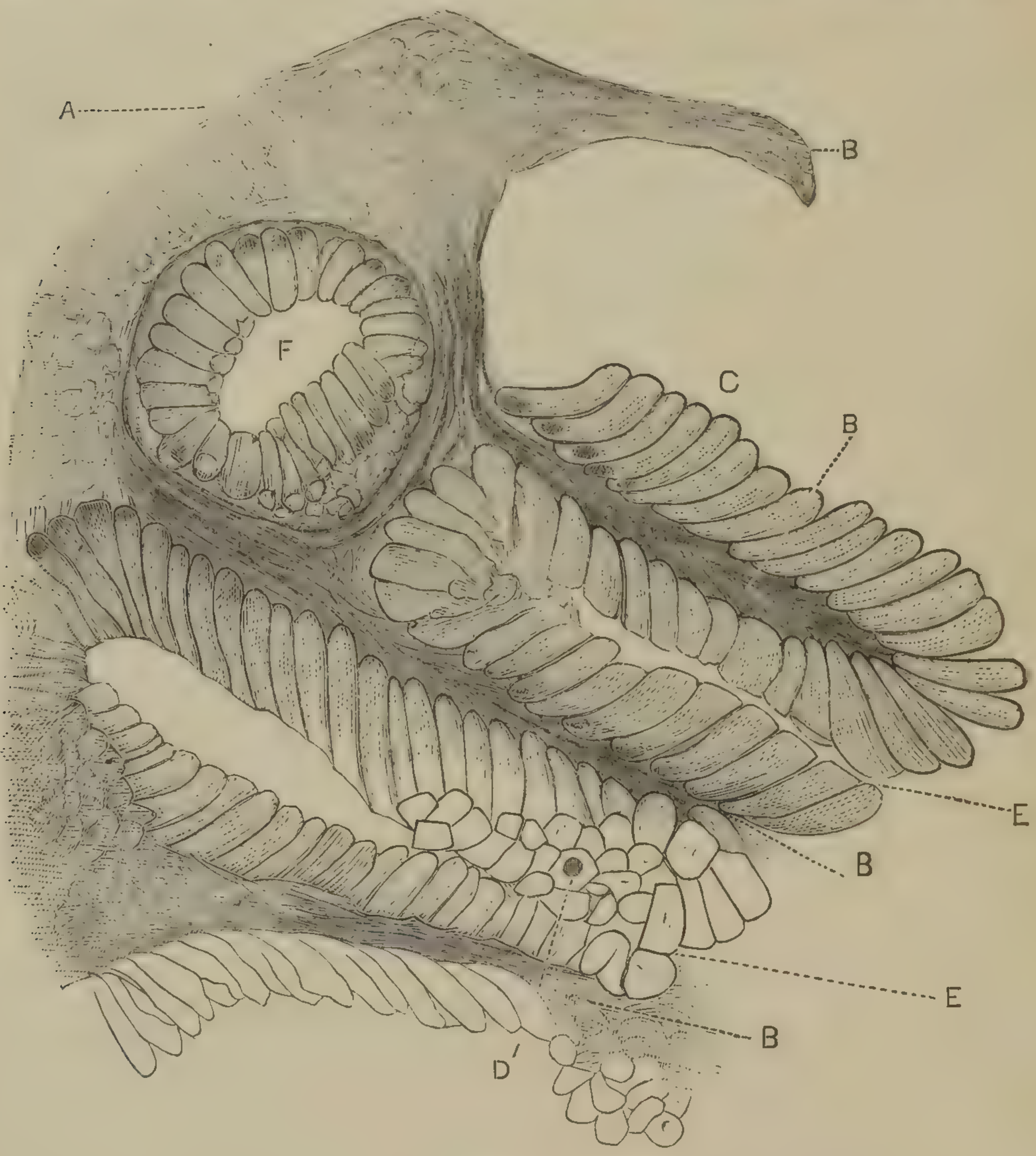

FIG. 57.

Pancreas Cyst. A, Connective tissue; BB, tongue-shaped prolongations of the same; C, Epithelium in side-view ; D, Epithelium in front-view ; EE, open epithelial pouches ; F, closed epithelial pouch surrounded by connective tissne, × 400.

come secondary cysts. Later a process of absorption takes place in the partitions and several secondary cysts melt together to one or open into the main cyst.

In several places the epithelium was found raised from the underlying tissue by extravasated blood.

In the discussion following my exhibition of specimens taken

from this cyst, in the Pathological Society,[1] Dr. Geo. L. Peabody mentioned a case which he had found at an autopsy, and where the cyst consisted of connective tissue, and was lined with cylindrical epithelium, exactly as in my specimens.

22. *Cysts of the Omentum.*

Cysts of the omentum are perhaps still rarer than those of the pancreas. Peaslee mentions a case of a subperitoneal serous cyst combined with an omentum "studded with or rather made up of clusters of hydatid-looking growths, which varied in size from that of a swan-shot to that of a grape. Some of these were cystic and contained a clear fluid; they could be most readily detached from their points of attachment. The fluid would not coagulate when heat was applied." This would make us think of echinococci, but on scraping the interior of the cysts, and placing the débris under a microscope, an abundance of large circular nucleated cells could be seen, as well as numerous spindle-shaped ones.

Dr. Thomas[2] mentions a case reported by Safford Lee, which was tapped forty-eight times, and was found by autopsy to be omental.

I have myself tapped a case (xxvi.) belonging to this class. From the clinical facts and the relations found immediately after tapping I took it to be a collection in the omentum accompanying cancer. The patient was a woman, fifty-five years old. In the right side of the abdomen was found a freely movable tumor as large as the two fists, the lower part was fluctuating, the upper very hard and tender on pressure. From this part a broad petiolus went up to the lower surface of the liver; four fluid ounces and two drachms of fluid were withdrawn when the cyst collapsed. The canula was felt to go right up to the hard part of the tumor. The liver border was felt about an inch lower than normal. The fluid was turbid, citrine, not viscid, specific gravity 1022, reaction strongly alkaline. No spontaneous coagulation, some by boiling, and the whole mass coagulated on addition of a drop of acetic acid. The coagulum was almost entirely redissolved by boiling with

[1] N. Y. Med. Record, 1882, p. 359.
[2] L. c., p. 154.
[3] L. c., p. 699.

excess of the same agent. The microscope revealed red blood-corpuscles, a few globular bodies with clear fat-granules, like Bennett's large corpuscles, small shreds of connective tissue, fresh endothelial cells, nuclei with shining granules, no ameboid bodies.

Another case is still more interesting, because here an operation (lx.) was performed which allowed to examine the cyst. On the 24th of February, 1882, Dr. Nathan Bozeman extirpated a cyst of this kind weighing ten pounds, seven pounds of which came on the fluid, three on the sac. In this case, the left ovary had been removed by Dr. Thomas three years previously, and the present tumor was taken for a cyst of the right ovary, but this was seen during the operation to be of normal dimensions. The tumors had developed within a year. It consisted of one large cyst occupying about one-half, while the other half was composed of a great number of smaller cysts, many of which communicated with one another through openings in the partitions, which were very thin. The outer walls were likewise very thin in most places, but the main cyst had a wall which was three millimetres thick, and composed of two layers of fibrous connective tissue bound together by some loose connective tissue, exactly like an ovarian cyst. The anterior surface was covered with bridges of tissue belonging to the omentum and supplied with a great many vessels, especially veins. Behind, the tumor was intimately adherent to the small intestine. It had no pedicle. After removal of the large cyst, there was seen a small one, likewise situated in the omentum. It had the size of a chestnut. On the abdominal wall, just above the bladder, were situated three or four dark-colored sessile subperitoneal cysts.

The outer surface was covered with peritoneal endothelium. The inner surface had no epithelium, but, by scraping, a great many round and oval flat cells with a small central nucleus were obtained. They varied much in size, but most of them were about two and one-half red blood-corpuscles in diameter. Cuts from specimens hardened in a one-fourth per cent solution of chromic acid followed by alcohol, showed that the outer parts of the wall consisted of broad stripes of connective tissue, forming a network in whose meshes lay isolated round or oval cells, while the innermost part consisted of similar cells only held to-

gether by very fine fibres. In this inner layer were found numerous arteries.

Cuts taken from that part of the specimen which contained many small cysts showed a similar young connective tissue full of small cells, and contained very much extravasated blood. Cuts from the isolated cyst in the omentum and from the small cysts on the abdominal wall showed a similar structure.

It appears from this description that all these cysts were formed in the meshes of the omentum and the subperitoneal connective tissue. It would seem that blood extravasation plays an important part in their development. The blood is probably gradually changed by serous exudation to a serous fluid; the tissue between two such small compartments breaks down and is absorbed, and the same process repeating itself, large cysts are formed. The abundant cell proliferation furnishes everywhere the material of which the connective tissue is built which forms the wall of growing cysts. It will be noticed how entirely different this mode of cyst growth is from that observed in ovarian and pancreatic tumors. In the omental and subperitoneal cysts the beginning takes place in the meshes of the subserous layer which are devoid of epithelium, while in ovarian and pancreatic cysts the growth begins with the proliferation of the columnar epithelium lining the original cyst, an enlarged Graafian follicle, by which secondary pouches are formed.

The *fluid* was slightly turbid, yellowish-brown, not viscid, of neutral reaction, and had a specific gravity of 1022. In two ounces of fluid two small coagula were formed spontaneously, one of the size of a hazel-nut swam on the top, the other, of the size of a pea lay on the bottom. The surrounding fluid contained only many red blood-corpuscles, some colorless blood-corpuscles, no ameboid bodies, epithelial cells, nor nuclei. The larger coagulum consisted of fibrin with a few blood-corpuscles and some flat roundish cells like those seen in the cyst-wall. The smaller contained very many red blood-corpuscles and few of the other cells. The fluid became almost solid by boiling, but the coagulum was almost entirely redissolved in an excess of boiling acetic acid.

This fluid, then, differed from ovarian, first, by its serous, not viscid consistence, although its color was as deep as dark

urine; second, by its spontaneous coagulation, and, third, by containing flat cells.

23. *Ascites.*

I. *Simple Ascites.*—The fluid found in the peritoneal cavity in cases of simple ascites due to disease of the liver, the heart, or the kidneys, is, as a rule, so different from that of ovarian cysts that it may be distinguished at the first glance, and a more thorough examination brings out very marked differences. The fluid is of a citrine or a yellow-gray color, clear or slightly turbid, not viscid, and has alkaline reaction. Its specific gravity has in my cases not been so low as generally stated. The lowest I have found, in a case of nephritis (tapped case xii.), was 1012, in the others it has been between 1021 and 1025. Thus this feature cannot be used for a diagnosis.

As a rule, some spontaneous coagulation takes place, showing the presence of *fibrin*. The coagulum may be quite small, not larger than a bean, from two ounces of fluid. Sometimes there is none at all, and on the other hand we have seen that spontaneous coagulation may take place in ovarian cyst fluid.

On boiling, we usually obtain a large and hard coagulum, due to the presence of *albumen*. But sometimes the precipitate is rather scant (tapped cases xii., xxiii.), even on adding a drop of acetic acid.

Boiled with an excess of acetic acid it ought to be unchanged or only become a little yellow, if Scherer's test were correct.[1] In my experience this test has no diagnostic value whatever. Out of six cases of simple ascites, the coagulum remained unchanged in one only (t. c. xii.), was mostly gelatinized in one (t. c. xxiii.), and entirely redissolved in two (t. c. xxix. and op. c. liii.). In the two remaining the test had not been made.

The greenish color is said by Péan[2] to be due to *biliverdine*, a coloring matter found in the bile. The same author states that *cholesterin* is sometimes found in peritoneal fluid when the collection is old.[3] In very rare cases it has been found milky.[4]

While the physical and chemical properties are not to be re-

[1] Thornton in Med. Times and Gazette, May 13th, 1876.
[2] Tumeurs de l'Abdomen, vol. i., p. 406.
[3] Ibid., p. 413.
[4] Ibid , p. 407.

lied on for a diagnosis, the microscope reveals elements which show with absolute certainty that the fluid in question cannot be ovarian. We find the large roundish *flat endothelial cells* with comparatively small nucleus. Sometimes they are more or less changed, the nucleus disappears and the body undergoing fatty degeneration, contains black dots or shining small globules, or the whole is only an agglomeration of globules (Figs. 34, 58, 59). At other times, flakes of melting endothelium are

FIGS. 58, 59.—Peritoneal endothelium from ascitic fluid, in a state of more or less advanced fatty degeneration.

seen, mostly composed of a thready mass containing free nuclei or small cells (tapped case xxiii.), which are much like epithelial flakes in a similar condition (Fig. 31). Sometimes these cells are seen brown-colored, probably due to coloring matter taken up from the extravasated blood. Columnar epithelial cells are never found, nor are well-developed Bennett's corpuscles, nor nuclei with shining granules.

The second important morphological element are *lymphoid corpuscles*. These are found in very great numbers, and when the fluid is fresh they are seen to move round by ameboid movements (Fig. 60). They are also found imbedded in the

FIG. 60.—Lymphoid corpuscle with ameboid movements, in five consecutive shapes. From ascitic fluid.

fibrinous meshwork, composing the coagulum where one is present. They measure from 6 to 11 μ without the offshoots. These bodies are never found in ovarian fluid.

Besides these, we find smaller bodies without ameboid movements entirely like those represented in Fig. 21 from ovarian cysts. They are probably nuclei set free from melted endothelial cells.

Finally, we find red blood-corpuscles and protoplasmic granules, remnants of larger bodies which have been disintegrated.

Contrary to what is the rule with ovarian fluid, the elements of ascitic fluid are commonly destroyed in a short time.

II. *Cancerous Ascites.*—I have stated in an earlier part of this treatise that I had not been able to find any peculiar characters in the fluid contained in cancerous or other malignant ovarian cysts. I am more inclined to think that the ascitic fluid accompanying cancer of the peritoneum has characters by which it can be recognized. I have only obtained the fluid from four cases of this kind. In one (t. c. xiv.) the fluid was sent to me

FIG. 61.—Endothelial flake and isolated cell from cancerous ascites.

by Dr. Thomas for diagnosis without the least information about the clinical features of the case. I made the diagnosis of ascites accompanying malignant disease. Dr. Thomas came to the same conviction when on opening the abdominal cavity he found the peritoneum studded with cancerous looking masses. I based my diagnosis, first, on the above-mentioned characters of simple ascitic fluid; second, on the presence of a great amount of red blood-corpuscles and lymph-corpuscles; and, third, on the presence of large groups of endothelial cells of very varying shape and size (Fig. 61).

Dr. Foulis[1] was the first who called attention to the possibility of diagnosticating malignant ovarian tumors and malignant peritonitis by the presence of little masses of "sprouting epithelium" found in ascitic fluid surrounding tumors in the abdomen. As far as I know, Dr. Foulis' paper has never been published *in extenso*. We know only its contents from a a report of the Transactions of the Medico-Chirurgical Society of Edinburgh. The description there is rather loose and not accompanied by any drawings, nor does the author state what he understands by the vague term of malignant disease.

Thornton,[2] who seems to have paid a great deal of attention to the character of different abdominal fluids, expresses himself with much greater precision, and gives figures illustrating what he has seen. He defines malignant disease as sarcomas, carcinomas, and certain peculiar ovarian papillomata. He has found his cells and cell-groups as well in ovarian cysts as in ascites. He says that he cannot agree with Dr. Foulis as to their always indicating malignancy when present with an ovarian tumor, as he (Thornton) has found them in the peritoneum when irritated by the rupture of an ordinary ovarian cyst, and as Dr. Keith has operated on patients with the nodular growths, from which he believes these cell-groups are shed, covering the peritoneal surfaces, and yet the patients have remained in good health. Supplementing Foulis, he says, furthermore, that they are not even characteristic of ovarian tumors, since he (Thornton) has found them with malignant disease of the uterus, the liver, and the omentum. Some, says he, look like mere clusters of lymph-corpuscles (like bunches of grapes); others like more or less flattened endothelial plates, arranged in layers, and others present every variety of size and shape, and every stage of growth. It is to these latter he attaches the most importance as indicating malignant disease, and this was one point I took into consideration in making the above-mentioned diagnosis, which proved to be correct.

As for my other cases, the first (i.) was sent from another city, and was perhaps not fresh enough. It contained endothelial cells in fatty degeneration, but no groups. Case xxvii. was sent by Dr. Bozeman, and supposed by him to be cancer of

[1] Foulis in Edinburgh Med. Journ., March and August, 1875.
[2] Thornton in Med. Times and Gaz., April 10th, 1875, and May 13th, 1876.

the omentum. I diagnosed it easily as ascitic. It contained an abundance of red blood-corpuscles, many of them in the well-known piles, which I have never seen in ovarian cysts. Next there were bodies resembling colorless blood-corpuscles, in a greater number than would correspond with the red. There were, finally, fresh and fatty endothelial cells, but neither in their shape, size, nucleus, nor arrangement did they present anything particular. Was it not cancer, as supposed, or was it cancer without any characteristic epithelial cells? Nobody can tell for sure. I would add that I found one endothelial cell which, being full of pigment granules, had great resemblance with what in ovarian cysts I have called the dark variety of Bennett's corpuscles.

The fluid from case iv., where the autopsy later showed cancer of the omentum, pancreas, and both ovaries, contained very few red blood-corpuscles, a great many colorless lymphoid

FIG. 62. Isolated and grouped epithelial cells from cancerous ascites.

bodies, and large round or pear-shaped endothelial cells, with a large nucleus and nucleolus, both single and in groups (Fig. 62); often with vacuoles. Besides these large cells, measuring 22–27 μ and more, were found quite small ones (Fig. 62 *b*).

In all other respects, all these malignant fluids showed the properties described in speaking of the simple ascites. The specific gravity varied between 1016 and 1025. The presence of much blood in ascitic fluid is a good sign of malignity, but we have seen that it may be absent. When the fluid contains much blood, it has a red-brown color, but after coagulation has taken place, a more or less clear citrine fluid occupies the upper part of the glass.

Routh [1] has published an article on three cases of "peritoneal tumors," which belong to this class. They were all taken

[1] Routh in Obstet. Journ. of Great Brit. and Ireland, 1874, p. 13.

with more or less certainty to be ovarian. The first gave several pints of dark clear fluid. The autopsy showed cancer of the peritoneum. In the second, the fluid "closely resembled ascitic fluid." The autopsy revealed cancer of the omentum. In the third, forty-five pints of clear green fluid were withdrawn. The autopsy showed cancer of the liver. Even in absence of all chemical and microscopical examination of the fluid, its aspect differed entirely from that of ovarian cysts.

III. *Ascitic fluid mixed with ovarian.* In two cases (operative xxxix. and xliv.), cyst contents had found their way into the peritoneal cavity. Once the cyst was found broken at the operation, and in the other case a small quantity of fluid had been aspirated five days previously, after which the patient had lost two inches in circumference. In these cases, the fluid taken from the peritoneum had some resemblance in general appearance with that taken from the cyst, but differed from it in other respects, showing that the fluid in the cyst had worked as an irritant on the peritoneum.

The endothelium had been thrown off in large flakes (Fig. 34), and undergone fatty degeneration. Ameboid lymphoid bodies were found side by side with columnar epithelial cells. The fluid was clearer and more citrine than the corresponding cyst fluid. It did not coagulate spontaneously in my cases.

Although there was a rent three inches long in the cyst in case xliv., the fluid yet found in the cyst differed in several respects from that found in the peritoneal cavity. The latter was full of lymph-corpuscles with ameboid movements, which were not found at all in the cyst fluid. The peritoneal fluid was clearer, apparently from admixture of serum. In the cyst were found a few nuclei with shining granules, in the peritoneal cavity none. The cyst fluid abounded in columnar epithelial cells seen in side-view, only a few were found in the peritoneal fluid. The epithelial cells seen in front view were all full of fat-drops and not to be distinguished from epithelial cells in a similar condition in an ovarian cyst, but, nevertheless, it is not likely that they were of this kind. If so, we would have found as many in side view as in the cyst, but while there were at least as many seen in front view as in the cyst, there were exceedingly few seen in side view. It is, therefore, probable that the majority were endothelial cells, and that,

through the inflammatory action going on in the peritoneum these became like columnar epithelial cells of ovarian cysts in a state of beginning fatty degeneration, and seen in front view.

24. *Encysted Peritoneal Collections.*

Under this name I unite all cases of collections of fluid inclosed in a kind of new-formed cyst due to adhesions. We have spoken above of Dr. Erich's case which was taken for an ovarian cyst. An examination of the fluid gave a specific gravity of 1030; it was of amber color, did not coagulate spontaneously, and left a thick deposit. A microscopical examination discovered granular bodies corresponding with the ovarian cell described by Dr. Drysdale. It will be seen that the color was one rarely found in ovarian cysts, and that nothing is said about the epithelial cells. Thus it is not unlikely that the fluid might anyhow have been recognized as being not ovarian.

Spencer Wells[1] mentions, in hisf ourth series of one hundred cases of ovariotomy, a case in which peritoneal fluid was evacuated by a small incision. Cystoid cavity formed by adhering coils of intestine and thickened peritoneum. Since the fluid was "peritoneal" it would have been possible to recognize it beforehand.

Cruveilhier[2] gives the history of a case where in a duel the celiac trunk was wounded. The patient lived two months. At the autopsy there was found an enormous sac filling the whole pelvis. It proved to be a *blood cyst* containing decolorated fibrin and a great quantity of serum. Although this patient happened to be a man, I mention the case, as showing that the fluid was entirely different from ovarian.

Péan[3] says that in *encysted traumatic peritonitis* the contents of the cyst are commonly a sero-sanguinolent fluid the color of which varies, but which has a rather uniform composition. Sometimes it has a reddish tint which suffices to show at the first glance its bloody character. At other times it is clear,

[1] Sp. Wells in Medico-Chir. Trans., Vol. liv., 1871, p. 269, case 5 of exploratory incisions.

[2] Cruveilhier, Traité d'Anatomie pathologique, vol. iii., p. 518.

[3] Tumeurs de l'Abdomen, Vol. i., p. 317.

citrine, and it is only by aid of the microscope that red blood-corpuscles are found. When heated it precipitates a certain quantity of albumen, but it is never viscid or ropy as ovarian fluid.

In several cases the fluid has been found purulent. Péan[1] relates a case in which another physician had withdrawn a red-brown, viscid, semi-solid fluid. At the autopsy was found stinking pus due to a perforation of the intestine. E. Mears,[2] of Philadelphia, has described a case which was believed to be ovarian. An exploratory incision was made and two gallons of fibrinous pus evacuated. A similar case is reported by Atlee.[3]

As I have not found a single accurate description of a fluid of this kind which was like ovarian, and as in most of the cases mentioned the mere aspect sufficed to show that it did not come from an ovarian cyst, I conclude that it would be possible by a careful examination to make the differential diagnosis of the fluid.

25. *Tapping.*

Our subject is exhausted, but I feel the necessity, from a practical point of view, to add a few words about the operation by which the fluid is obtained. If my labors shall have a practical value, they must induce operators to have the fluid examined in supposed ovarian tumors before they perform ovariotomy. We have seen that in almost all cases fluid from an ovarian cyst can be distinguished from any other kind of fluid except that of cysts of the broad ligament. Thus there is no doubt about the benefit to be derived in regard to diagnosis from a previous examination of the fluid. The question is only if the operation, by which the fluid is obtained, is in itself so dangerous as to counterbalance the advantages sought.

When ovariotomy began its triumphant course from country to country throughout the world, some enthusiasts, as is usually the case, went so far as to mark the operation of tapping as a crime, their chief argument being that it was not only

[1] Péan in Gazette médicale de Paris, 1873, No. 18.
[2] Mears in Trans. of College of Physicians, Philadelphia, 1875, p. 174.
[3] Ovarian Tumors, p. 160, and Am. Jour. Med. Sci., July, 1872, p. 133.

useless, but prejudicial for the ovariotomy by which it had to be followed. Spencer Wells[1] entirely refuted this aprioristic doctrine by examining his own first three hundred cases. The general mortality was 28.33 per cent. 135 of the patients had never been tapped. In them the mortality was 27.40 per cent, not one per cent less than the general mortality. Furthermore, the mortality of the patients not tapped, though less by about five per cent than that of patients who had been tapped twice, is greater than that of the patients who had been tapped once or three times. The mortality of cases tapped from four to sixteen times was exactly the same as of those who had been tapped only twice. Mr. Wells concludes by saying: "It may be taken then as almost certain that the mortality of ovariotomy is but little affected by tapping. In some of the patients who had been tapped most frequently, there were no adhesions, and there were firm adhesions in some who had never been tapped."

Another objection to tapping, and a much weightier one, is the danger connected with the operation itself of wounding a large vessel or of setting up inflammation. In the second volume of the Transactions of the American Gynecological Society[2] are found six cases of grave trouble attributable to tapping, two of which ended fatally by themselves, and two others after ovariotomy had been performed. In Dr. Lusk's case was found, after death, a quart of grumous blood in the peritoneal cavity. He had only used a fine aspirator-needle, but then the operation had been performed at his college clinic.[3] In all the other cases, the untoward symptoms are attributable to infection: septicemia, blood poisoning, peritonitis, inflammation of cyst.

Quite recently[4] tapping has been attacked by Thornton, Bantock, and Heath, and Bantock said he did not believe at all that septic matter could be introduced through tapping.

There is no doubt that injury may come from tapping, but

[1] Sp. Wells in Trans. Med. Chir. Soc., Vol. lii., 1869, p. 206.

[2] Goodell in Transact. Am. Gyn. Soc., ii., p. 265 seq.

[3] For the information of possible European readers, I must add that this word in this country has entirely lost its original meaning, of hospital wards where patients are lying in bed (*κλινη*).

[4] Lancet, January 15th, 1881; Am. Journ. Med. Sc., April, 1881, p. 580–583.

as a set off we must remember that great evil has resulted from not tapping. Numbers of times the peritoneal cavity has been opened, and not always with the precaution to proceed as if it were a mere exploratory incision, when the most divers pathological conditions have been found instead of the supposed ovarian cyst. There is no doubt in my mind that the deaths brought about in this way, and which might have been avoided by examining the fluid beforehand, greatly exceed those referable to tapping. In this category we would not find two or three deaths, but as many dozens if we would search the printed records, and still more if we could supplement the list by those which have not been published.

There might be adduced a third reason for abstaining from tapping, namely, that it is superfluous. In the preceding pages we have seen tumors of the kidney, the spleen, the pancreas, and the omentum, which had been taken for ovarian cysts, successfully operated on. To this I would answer that many surgeons, who are willing to perform ovariotomy would not like to grapple with these rare and, as a rule, more difficult cases. All patients cannot be brought to New York, London, Paris, or Berlin, to be treated by the most skilful operators commanding every instrument, appliance, or arrangement which may contribute to a favorable issue. The great majority of surgeons will prefer to know beforehand if they have to deal with an ovarian cyst or not.

Anyhow, the fact remains that tapping is an operation by which the patient's life may become endangered. It ought, therefore, to be performed with the same care as any other capital operation, and everything ought to be done in order to diminish the dangers inherent in it. First of all, it ought never to be done otherwise than with antiseptic precautions. By this term I do not think of the spray, which is entirely superfluous in this operation, but the instruments have to be not only clean, but kept immersed in a five-per-cent carbolic solution or in alcohol for at least five minutes before being used. The abdomen of the patient has to be washed first with soap and water, and then with carbolized water of at least 2.50 per cent. The excellent experiments of Wegner[1] have shown that the air in itself, when brought in contact with

[1] Wegner in Archiv für klinische Chirurgie, vol. xx., p. 91–98.

the peritoneum, does no harm. The mechanical injury caused by a small instrument is so slight that the risk is exceedingly small of producing inflammation in this way. But from decomposing organic material adherent to the instruments, or to the skin of the patients, comes the danger of septic inflammation or septicemia.

The danger of wounding blood-vessels cannot be avoided, but can be much lessened by the use of a thin instrument, by not plunging it too abruptly into the tumor to be examined, and by keeping the patient quiet after the operation.

Tapping ought never to be performed in the office or on outdoor patients calling at a hospital. It ought to be done antiseptically. An aspirator with a camula, not exceeding two millimetres in width, is preferable to a larger trocar. Aspiration takes sometimes much more time than to perform ovariotomy, but when the life of our patient is at stake, time ought not to come into consideration.

The whole collection of fluid contained in the compartment opened ought to be withdrawn. Else the fluid left may work its way out into the peritoneum and set up peritonitis. From this rule only fibro-cysts of the uterus are to be excepted. In these the evacuation of the tumor, the walls of which are commonly too unyielding to collapse, has proved very deleterious. If, therefore, the clinical features of the case make it likely that the surgeon has to deal with a cyst of this description, and if the fluid seems to corroborate his view, he had better withdraw only a couple of ounces, which will afford the opportunity of a chemical and microscopical examination.

After any aspiration, the patient ought to be kept in bed for four days.

These are the rules I have followed myself, and by using such precautions, I feel confident that untoward accidents attributable to tapping will become exceedingly rare, and that the chances of benefit to the patient are much greater by making sure of the diagnosis by a thorough examination of the fluid, than the risk incurred by the previous aspiration. Nevertheless, it is perhaps not advisable to tap a cyst unless ovariotomy can be performed if required. If inflammation sets in, the proper course to be pursued is to perform ovariotomy immediately.

26. *Conclusions.*

1. The examination of the fluid from abdominal tumors affords a very valuable aid to diagnosis. By studying the physical, chemical, and microscopical characters it is almost always possible to diagnosticate ovarian cysts, even without knowing anything about the patient, and of course still more so when the result is combined with the other features of the case.

2. The *physical characters* give myxoid ovarian fluid in most cases a certain appearance by which it is recognized at once.

3. The *viscidity* is the most important physical character when present, but may be wanting in ovarian, and present in non-ovarian fluid.

4. The higher *specific gravity* may be of some use in distinguishing ovarian fluid from that of a cyst of the broad ligament. In the differential diagnosis between ovarian cysts and ascites it has only some value in extreme cases.

5. The color, limpidity, odor, and reaction are not characteristic.

6. No *chemical* product peculiar to ovarian fluid has been found.

7. *Coagulation.* As a rule, ovarian fluid does not coagulate spontaneously, and when it does, the coagulation takes place slowly. Ascitic fluid as a rule coagulates spontaneously and slowly, forming a small coagulum. The fluid of uterine fibro-cysts does sometimes coagulate, and then in a mass and immediately (see below). In a case of sarcomatous tumor (case xxvi.: osteo-myxo-chondro-sarcoma of the os ilium) a large clot was formed by being exposed to the air.

8. Ovarian fluid coagulates as a rule to a great extent or entirely by heat.

In two cases out of three of cysts of the broad ligament, this coagulation did not take place. The third was not tested in this respect.

9. *Scherer's test for paralbumen.* In most cases the coagulum formed by boiling alone or with a drop of acetic acid to counterbalance alkalinity was more or less completely redissolved by boiling with the same reagent in excess. But the test is not reliable. Some ovarian fluids were little or not at

all changed, and in some tapped cases which decidedly were not cystic, but ascitic, complete redissolution of the coagulum took place.

10. In ovarian fluid, the histological elements are as a rule preserved for a more or less long time (weeks or months). Not so with the fluid from ascites, and from cysts of the broad ligament. When present, this character has diagnostic value, its absence none.

11. The *microscopical* examination is of much greater importance than the physical and chemical (inclusive of spectroscopy).

12. It is only by studying the cyst-walls and especially by tracing the formation of cysts back to its very beginning that we can come to understand the fluid they contain.

13. Fluids ought to be examined as fresh as possible, for though ovarian fluid often may be recognized after months, sometimes it is not the case, and other fluids are often changed very soon, larger bodies being broken down to granules or altogether dissolved, and movements arrested.

14. The bodies seen in ovarian fluid are red blood-corpuscles, epithelial cells, nuclei, granules, pigment, finely granular globular bodies like lymph-corpuscles or colorless blood-corpuscles, pus-corpuscles, spindle-shaped cells, colloid masses, cholesterin and indican.

15. The epithelial cells are columnar.

16. In one case were found corpuscles with ameboid movements.

17. Bennett's large corpuscles are epithelial cells in fatty degeneration.

Another kind which I call the dark variety of Bennett's corpuscles are epithelial cells filled with pigment.

18. Bennett's small corpuscle, Drysdale's "granular ovarian cell," is no cell, but the nucleus of an epithelial cell in a state of fatty degeneration.

19. The small bodies with dark granules so common in ovarian fluid are likewise nuclei of epithelial cells.

20. There is no pathognomonic morphological element in ovarian fluid.

21. The most important element in regard to diagnosis are columnar epithelial cells seen in side view. Their presence

excludes all other tumors than those of the ovary, Fallopian tube, and broad ligament (perhaps with the exception of a cyst of the pancreas).

22. Bennett's corpuscles, Drysdale's corpuscles, nuclei with dark granules, and cholesterin have no diagnostic value.

23. Cysts of the broad ligament cannot be distinguished from those of the ovary.

24. John Hughes Bennett, of London, was the first who described and delineated both the large and the small granular bodies commonly found in ovarian cysts and noticed that the latter have no nucleus, not even after addition of acetic acid.

25. Eichwald was the first to mention the presence of colloid globules, horn-cells, cholesterin, and pigment.

26. Waldeyer was the first who pointed out the presence and diagnostic value of the columnar cells.

27. If a fluid contains hair or epidermal scales, or is composed of melted fat, it is *dermoid*, but nothing shows that it is ovarian. Sometimes dermoid ovarian cysts contain a fluid like that of myxoid cysts. Sometimes both these classes of characters are combined, and then the diagnosis of dermoid ovarian cyst can be made.

28. A fluid as clear as water and containing very few histological elements and without nuclei with shining granules (Drysdale's "ovarian cells") may be found in ovarian cysts, both true monocysts (hydrops folliculi), and multilocular cysts with ciliated epithelium.

29. Neither the quantity, nor the size, nor the shape, nor the arrangement of the elements found in cystic fluid enables us to tell that the cyst is sarcomatous, or carcinomatous, but only that it is ovarian.

30. *Cysts of the broad ligament* are much rarer than ovarian cysts.

31. Both ovarian cysts and cysts of the broad ligament may have serous or colloid contents, but the latter is common in ovarian cysts, rare in extraovarian cysts, while watery fluid is common in extraovarian, rare in ovarian cysts.

32. *Uterine fibro-cysts* are very rare. All cases in which a sufficiently large quantity of fluid was withdrawn and coagulated spontaneously, promptly and completely, have proved to

be fibro-cysts of the uterus. But coagulation takes only place in the fluid from a minority of uterine fibro-cysts.

The presence of a fluid which, after a long exposure to the air, precipitates fibrinous clouds, or which gelatinizes on addition of blood or serum, does not prove that it comes from a fibro-cyst.

33. Atlee's fibre-cell is not always found in uterine fibro-cysts; and may be present in ovarian cysts.

34. None of the other microscopical elements, more or less changed epithelial cells, found in uterine cysts have any diagnostic value.

35. Columnar epithelial cells are never found in uterine cysts.

36. *Amniotic fluid* is entirely different from ovarian. It contains large flat epidermal scales full of fat and free fat masses.

37. It is doubtful if the fluid of *dropsy of the Fallopian tube* can be distinguished from that of ovarian or uterine cysts, or those of the broad ligament. But tumors of this kind, large enough to call for surgical intervention, are exceedingly rare, and can be removed so that no harm would arise from an erroneous diagnosis.

38. A fluid like that of lymphectatic uterine tumors, which coagulates promptly in a mass on exposure to air, has been found in a tumor of the same kind developed in the round ligament.

39. *Cysts in the abdominal wall* may occasionally become so large as to simulate ovarian cysts. The fluid differs from that of ovarian cysts by being limpid, serous, lemon-colored, and devoid of epithelial cells, or their derivata.

40. The fluid from *urachus cysts* differs from ovarian fluid by containing *flat* epithelial cells.

41. Cases of *spina bifida* have formed a tumor in the pelvis which had the appearance of an ovarian cyst. The fluid contained no albumen nor any histological elements, and might have been recognized as non-ovarian.

42. A single hooklet or the smallest piece of cuticula is pathognomonic for *echinococci*, but they are not always found in the fluid coming from these tumors. It is without albumen or contains only traces thereof, but this may also be the case with

ovarian cysts. It contains succinic acid, leucin, grape-sugar, inosit, none of which have ever been found in ovarian cysts. Uric acid and urea have been found in both kinds. Paralbumen has never been found in echinococci. Thus the differential diagnosis can be made by chemical and microscopical examination.

43. *Cysts of the mesentery* can be distinguished from ovarian by containing serous fluid without epithelial cells.

44. *Cysts of the spleen* are of so rare occurrence that only a single one is on record. It might have been recognized as non-ovarian by the fluid which, although it was thick, viscid, yellowish-brown, full of albumen, *leucocytes*, and cholesterin, did not contain any epithelial cells nor their derivata.

45. *Cysts of the liver*, when we except echinococci, are likewise very rare. The fluid differs from that of ovarian cysts by the absence of the characteristic elements and probably of paralbumen, and sometimes by containing bile or liver-cells.

46. *Hydronephrosis* may sometimes be differentiated from an ovarian cyst by the presence in the fluid of a large quantity of urea, flat epithelial cells, and by its acid reaction. A small amount of urea may be found in both. Likewise has paralbumen been found in hydronephrosis. When no kind of epithelial cells are found, and the chemical composition is not characteristic, the diagnosis may be impossible.

47. *Renal cysts* of large size are rare. Their contents may be very like those of ovarian cysts, especially be full of nuclei with shining granules, and form a coagulum by heat which is redissolved by boiling acetic acid in excess. The macroscopical appearance is not characteristic. Sometimes urea in large proportions and uric acid are present which settles the differential diagnosis, but at other times there is none. Sometimes flat epithelial cells are found, at other times the characteristic short columnar or cubic epithelial-cells as found in the urine of patients suffering from catarrhal nephritis. The long columnar epithelial-cells found in ovarian cysts are never found in renal cysts. By these different properties it will probably always be possible to differentiate them.

48. A *cyst of the pancreas* built exactly like an ovarian cyst, contained a fluid differing from ovarian by the acid reaction,

the uniform, small size of the nuclei, and the presence of peculiar thready bodies.

49. The fluid from a large *cyst of the omentum* differed from ovarian by being serous, not viscid, although it was dark; by spontaneous formation of small coagula, and by containing flat interstitial cells.

50. *Ascites* can sometimes be recognized by mere inspection. The specific gravity cannot be used for a diagnosis. As a rule, some spontaneous coagulation takes place, but sometimes not. On the other hand, ovarian fluid may coagulate spontaneously. Scherer's test for paralbumen has no value for the differential diagnosis. It can always be made by the microscope, showing flat endothelium and ameboid lymph-corpuscles.

51. Ascites arising from cancer of the peritoneum differs perhaps from simple ascites by containing large round or pear-shaped endothelial cells with large nucleus, either isolated or in groups. It differs from ovarian fluid by the same characters as simple ascites.

52. *Ascitic fluid mixed with ovarian* is full of endothelial cells and flakes which undergo fatty degeneration. Ameboid lymphoid bodies are found together with columnar epithelial cells. It did not coagulate spontaneously in my cases. Even when there is a long rent in a cyst, the fluid inside and outside the cyst may be different.

53. *Encysted peritoneal collections* differ commonly by their mere aspect which is like ascitic fluids from ovarian. The fluid is never viscid. Bodies like Drysdale's ovarian cell have indeed been found in them, but never columnar epithelial cells. If purulent, these fluids can perhaps not be distinguished from that of an ovarian cyst which has been suppurating for some time.

54. The danger connected with performing operations for supposed ovarian cysts which turn out to be other diseases is much greater than that arising from tapping with proper precautions.

55. The instruments ought to be immersed in a five-per-cent carbolic solution or in alcohol for at least five minutes.

The abdomen of the patient ought to be washed with soap and water and then with carbolized water. The danger of

causing hemorrhage is much lessened by using a thin instrument and by pressing it slowly into the tumor. Aspiration is preferable. The compartment of a cyst which has been opened ought to be entirely emptied, except if it is a uterine fibro-cyst.

Aspiration ought never to be performed in the office or out-door departments, and after the aspiration the patient ought to be kept in bed for four days. The possibly arising indication for ovariotomy within twenty-four hours ought to be kept in the mind.

27. *Appendix.*

Material not used in the Preceding Chapters.

I add a few remarks on some of the fluids found in tapped cases and not used for the preceding chapters.

Case IX. *Fluid from Thoracic Cavity.* Citrine, clear, not viscid. Specific gravity 1014. No odor. Alkaline reaction. Small coagulum on bottom of vessel. Some precipitation by heat, more by adding a drop of acetic acid, cleared up by excess of boiling acetic acid. Microscopical elements: Lymph-corpuscles, some with ameboid movements, flakes of endothelium composed of angular cells twelve to sixteen μ in diameter, each with a nucleus, red blood-corpuscles. The coagulum, tough, elastic, composed of fibrin crowded with lymph-corpuscles and endothelial cells.

Case XIII. *Hydrocele.* 15 fluid ℥, light-yellow, clear, much like urine, not viscid, specific gravity 1027, no odor, alkaline reaction, no spontaneous coagulation, became one solid mass on boiling, unchanged by boiling acetic acid in excess. Morphological elements: red blood-corpuscles, ameboid lymphoid cells, flat endothelial cells with large protoplasmic granules; on addition of acetic acid they showed a large round or kidney-shaped nucleus.

Case XXI. *Congenital Cyst of Neck of a little Child.* Fluid light yellowish-gray, alkaline, not viscid. Quantity too small for other tests. Microscopical elements: Hematoblasts, red blood-corpuscles, breaking down flat epithelial cells, leaving a round, colorless nucleus, small free nuclei, indican.

Case XXXI. *Blisters from Scalding.* Citrine, clear, alkaline fluid, no spontaneous coagulation, contains a few flat

epidermal scales, a few red blood-corpuscles, and a large number of spheric slightly granular cells, one and a half red blood-corpuscles in diameter, with or without nucleus, not changed by acetic acid.

Case XXXIII. *Congestive Abscess of Femur* of five years' standing. Tumor in Scarpa's triangle as large as head of adult. Fluid yellowish, turbid, viscid, alkaline, aromatic, separates on standing in an almost clear upper part, and a deposit measuring one-third of the whole, full of glistening cholesterin; did not coagulate spontaneously, but entirely by boiling, coagulum not changed by excess of boiling acetic acid. Microscopical elements: red blood-corpuscles, cholesterin, spherical or slightly polyhedral cells with single, rarely double nucleus and fat-globules in corpus, eleven to twenty-two μ in diameter, many nuclei with shining granules. None of these cells were like any kind of epithelial cells, but were mere indifferent cells undergoing fatty degeneration or melting. Acetic acid dissolved the body and left the nucleus free. The nuclei with shining granules were only cleared up a little.

The fluid had neither macroscopically nor microscopically the appearance of pus, but similar cells were found in large number in a case of vaginal cyst I have examined.

I need scarcely add that none of these fluids resembled those found in ovarian cysts.

A.—*Operative Cases.*

Number.	Date.	Operator.	Diagnosis.
	1880.		
I.	Feb. 21	Thomas.....	Myxoid proliferous glandular cystoma of ovary.
II.	Feb. 21	Thomas.....	Myxo-dermoid proliferous glandular cystoma of ovary.
III.	Feb. 21	Thomas..	Myxoid proliferous glandular cystoma of ovary.
IV.	Feb. 26	Noeggerath....	Suppurating ovarian cyst.
V.	Feb. 28	Thomas.....	Cyst of broad ligament.
VI.	Mar. 12	Bozeman	Myxoid proliferous glandular cystoma of ovary with ciliated epithelium and external papillomas.
VII.	Mar. 18	C. C. Lee.....	Suppurating cyst of abdominal wall.
VIII.	Mar. 20	Thomas.....	Myxoid proliferous papillary cystoma of ovary.
IX.	Mar. 26	Thomas.....	Cystic fibro-sarcoma of ovary.
X.	April 3	Thomas.....	Myxoid proliferous glandular cystoma of ovary.
XI.	April 17	Thomas.....	Cyst of broad ligament.
XII.	April 28	Thomas.....	Ditto.
XIII.	May 4	Bradt. (Autop.)	Medullary carcinoma of ovarian cyst.
XIV.	April 19	Dawson.....	Beginning cystic degeneration of ovaries. Oöphorectomy.
XV.	May 15	Thomas.....	Myxo-fibromatous cyst of ovary.
XVI.	Aug. 21	Bopp.....	Myxoid proliferous glandular cystoma of ovary.
XVII.	Sept. 23	Thomas.....	Ditto.
XVIII.	Sept. 25	Thomas.....	Myxoid proliferous papillary cystoma of ovary.
XIX.	Sept. 28	B. Emmet	Myxo-dermoid proliferous glandular cystoma of both ovaries.
XX.	Oct. 2	Thomas..	Carcinomatous cystoma of ovary.
XXI.	Oct. 5	Bopp.....	Myxoid proliferous glandular cystoma of ovary.
XXII.	Oct. 10	Thomas.....	Myxo-dermoid proliferous glandular cystoma of ovary.
XXIII.	Oct. 15	Bozeman.	Myxoid proliferous glandular cystoma of ovary.
XXIV.	Oct. 18	Noeggerath.. .	Ditto.
XXV.	Oct. 19	Bopp.....	Ditto of both ovaries.
XXVI.	Oct. 20	Adler	Cystic osteo-myxo chondro-sarcoma of the iliac fossa.
XXVII.	Oct. 23	Thomas.....	Myxoid proliferous glandular cystoma of ovary.
XXVIII.	Oct. 26	T. A. Emmet...	Ditto.
XXIX.	Oct. 29	Bozeman	Ditto. Beginning carcinoma.
XXX.	Nov. 4	T. A. Emmet...	Myxoid proliferous glandular cystoma of ovary.
XXXI.	Nov. 6	Thomas..	Ditto.
XXXII.	Nov. 6	Thomas.....	Myxoid proliferous papillary cystoma of ovary.
XXXIII.	Nov. 13	Thomas.....	Hydrops of Graafian follicle. True monocyst.
XXXIV.	Nov. 17	Garrigues (Autopsy).	Myxoid proliferous glandular cystoma of ovary.
XXXV.	Nov. 19	Bozeman	Ditto.
XXXVI.	Nov. 20	Thomas.....	Ditto.
XXXVII.	Nov. 23	Noeggerath....	Ditto.
XXXVIII.	Dec. 1	Dawson.....	Suppurating ovarian cyst.
XXXIX.	Dec. 3	Bozeman	Myxoid proliferous glandular cystoma of ovary.
XL.	Dec. 10	Bozeman	Myxoid proliferous papillary cystoma of ovary.
XLI.	Dec. 11	Thomas.....	Cystic fibro-sarcoma of ovary.
XLII.	Dec. 14	T. A. Emmet ..	Myxoid proliferous glandular cystoma of ovary. Beginning carcinoma.
XLIII.	Dec. 17	Bozeman	Myxoid proliferous glandular cystoma of ovary.
XLIV.	Dec. 20	J. B. Hunter...	Ditto.
XLV.	Dec. 28	T. A. Emmet...	Ditto.
	1881.		
XLVI.	Jan. 8	Thomas.....	Ditto.
XLVII.	Jan. 15	Thomas.....	Ditto.
XLVIII.	Feb. 19	Thomas.....	Cysto-sarcoma of ovary.
XLIX.	Feb. 19	Thomas.....	Ditto.
L.	Mar. 5	Thomas.....	Myxoid proliferous glandular cystoma of ovary.
LI.	Mar. 18	Bozeman	Proliferous papillary cystoma with ciliated epithelium.
LII.	Mar. 26	Thomas.	Myxoid proliferous papillary cystoma of ovary.
LIII.	April 9	Thomas.....	Uterine fibro-cyst (myoma lymphangiectodes).
LIV.	April 11	J. B. Hunter...	Myxoid proliferous glandular cystoma of ovary.
LV.	April 14	T. A. Emmet ..	Ditto.
LVI.	April 30	Thomas.....	Ditto.
LVII.	April 30	Thomas..	Ditto.
LVIII.	Oct. 15	Thomas.....	Renal cyst.
LIX.	Dec. 2	Bozeman	Pancreas cyst.
	1882.		
LX.	Feb. 24	Bozeman	Cyst of omentum.

B.—*Tapped Cases.*

Number.	Date.	Operator.	Diagnosis.	Remarks.
	1880.			
I.	Feb. —	H. K. Bennett ...	"Cancer of omentum and peritoneum."	Autopsy.
II.	Mar. —	Unknown.....	"Abdominal tumor in a man."	
III.	April 1	Polk.....	"Ascites from cardiac and Bright's disease."	
IV.	April 26	Gillette.....	Carcinoma of omentum, pancreas and ovary.	Autopsy. Operative Case XIII.
V.	April 30	Bozeman	Cyst of broad ligament (or ovary).	
VI.	April 28	Thomas.....	Ditto.	
VII.	May 1	Thomas.....	Ditto.	
VIII.	May 5	Ripley.....	"Ascites from cirrhosis of liver in male."	
IX.	May 7	Ripley.....	"From thoracic cavity."	
X.	May 5	Mundé	Cyst of ovary (or broad ligament).	
XI.	May 16	Bozeman	Cyst of broad ligament (or ovary).	Operative Case XXIII. (ovarian).
XII.	May 18	N.S.Cheesman...	"Ascites from nephritis in male."	
XIII.	Aug. 19	Garrigues..	Hydrocele.	
XIV.	Sept. 21	Thomas.....	Ascites from malignant disease.	Diagnosis confirmed by laparotomy
XV.	Oct. 4	Garrigues.....	Ovarian cyst.....	Op. Case XXXVII.
XVI.	Oct. 17	Gillette.....	Cyst of ovary (or broad ligament).	
XVII.	Nov. 3	Thomas.....	Cyst of ovary (not uterine).	Op. Case XXXI.
XVIII.	Nov. 11	Thomas.....	"Ovarian cyst."	
XIX.	Nov. 12	Bozeman	Ascites (fluid decomposed)....	Clinical diagnosis obtained later: ascites from cancer of omentum.
XX.	Nov. 12	Bozeman	Cyst of ovary (or broad ligament).	Operative Case XL. (ovarian).
XXI.	Nov. 12	Oberndorfer.....	"Congenital cyst of neck in a child."	
XXII.	Nov. 16	Thomas.....	"Ovarian cyst.".....	Sent after ovariotomy.
XXIII.	Nov. 22	A. Lowenthal....	"Ascites from cirrhosis of liver."	
XXIV.	Nov. 24	Garrigues.....	Ovarian cyst.	
XXV.	Nov. 28	Bozeman	Cyst of ovary (or broad ligament).	Op. Case XXXIX. (ovarian).
XXVI.	Nov. 29	Dawson.....	"Ovarian cyst.".....	Operative Case XXXVIII.
XXVII.	Dec. 17	Bozeman	"Ascites from cancer of omentum."	
	1881.			
XXVIII.	Jan. 12	Garrigues.....	Liquor amnii.	
XXIX.	Jan. 24	J. B. Hunter. ..	Ascites.	
XXX.	Feb. 15	Bozeman	Cyst of ovary (or broad ligament).	Operative Case LI. (ovarian).
XXXI.	Mar. 21	Garrigues.....	Blisters from scalding.	
XXXII.	April 23	Noeggerath.....	"Renal cyst".....	Obtained by laparotomy.
XXXIII.	May 3	Gerster.....	"Congestive abscess of five years' standing."	Extirpation attempted.
XXXIV.	May 9	Mundé.....	Cyst of ovary (or broad ligament).	
XXXV.	May 21	Garrigues.....	Cysto-sarcoma of ovary... ...	
XXXVI.	June 15	Garrigues.. ..	Cyst in omentum with cancer.	
XXXVII.	Sept. 10	Robt. Townshend	"Liver cyst" (?).....	Autopsy.